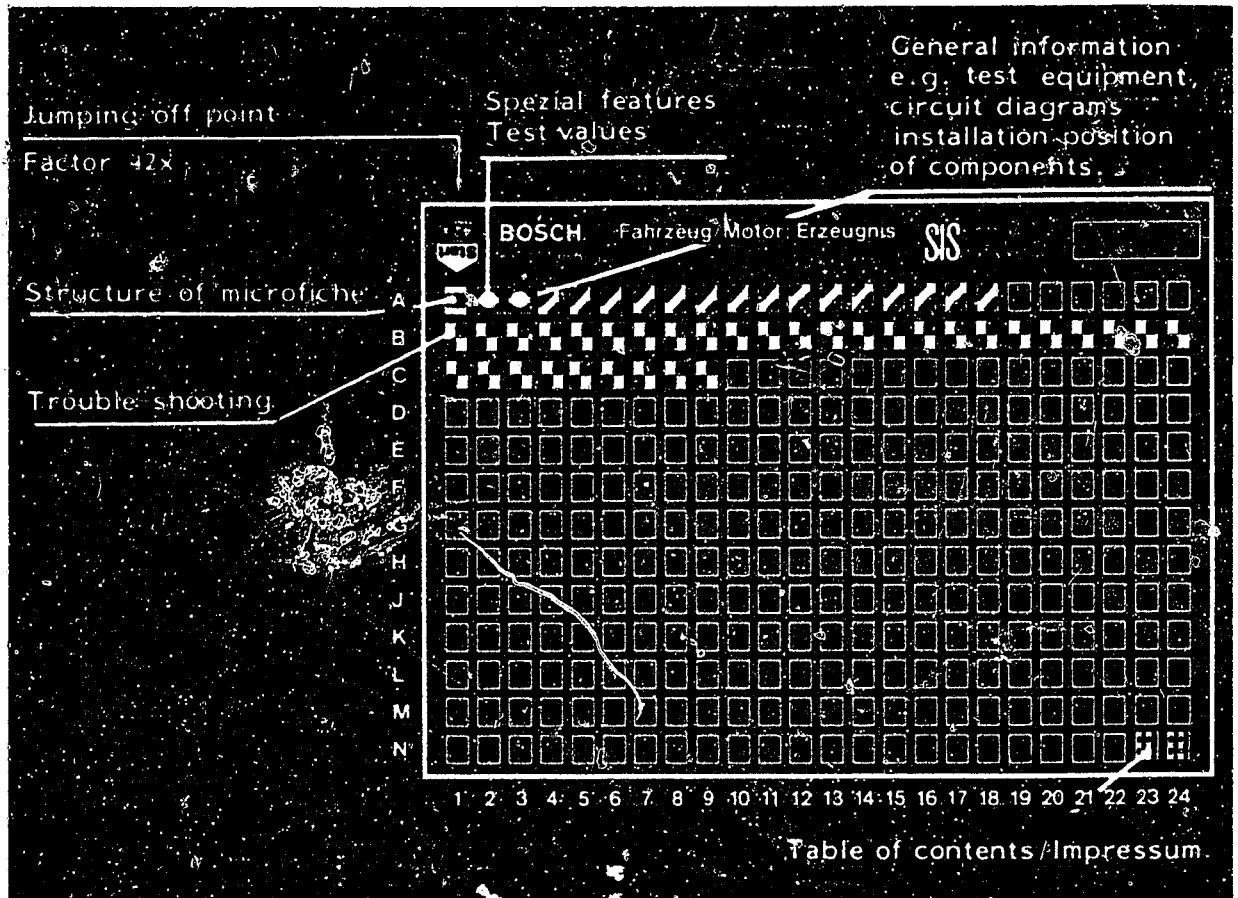


## Structure of microfiche



1. Read from left to right
2. Title of microfiche (appears on each coordinate)

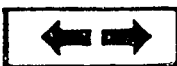
|            |                             |
|------------|-----------------------------|
| <b>E16</b> | Product/component/test step |
|            | Vehicle/engine              |

Coordinate

3. Limits of section



Beginning



Mid-section



End



One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

**C6**

|           |                          |  |
|-----------|--------------------------|--|
| <b>A1</b> | Trouble-shooting program |  |
|-----------|--------------------------|--|

## 1. Special features

The knock and boost-pressure control in the Porsche 944 Turbo works in conjunction with the Motronic system installed in this type of vehicle. The Motronic system has its own separate microfiche.

|                             |             |          |
|-----------------------------|-------------|----------|
| Start of series production: | 944 Turbo   | 12.84 -> |
|                             | 944 Turbo S | 9.87 ->  |

As of model year 89 the S-version will be completely replacing the previous 944 Turbo, i.e. the equipment in the S-version will be becoming standard equipment. As of model year 89 the only type designation will be 944 Turbo.

### Modifications:

The engine power has been increased in the S-version from 162 kW to 184 kW.

To achieve the increased power, use has been made of a modified turbocharger as well as a new Motronic and knock/boost-pressure control unit.

Whereas the lambda and ignition map in the Motronic control unit has been adapted, the knock/boost-pressure control unit has been given a modified boost-pressure map. The boost pressure has been increased in the full-load range by 70 mbar to 1.82 bar absolute.



## 2. Test specifications

Throttle-valve sensor (Potentiometer):

**B 15**

Total resistance between term. 1  
and term. 2 3...5 k $\Omega$

Resistance between wiper  
term. 3 and term. 2 250...800  $\Omega$   
(Throttle valve closed)

Knock sensor up to approx. 9.87:  
Internal resistance 270 ... 330 k $\Omega$

**B 11**

Tightening torque 8 ... 10 Nm

Knock sensor as of model year 88:

Internal resistance  $\infty \Omega$

Tightening torque 8 ... 10 Nm

Attach knock sensor without washer.

Internal resistance of frequency  
valve 18 ... 45  $\Omega$

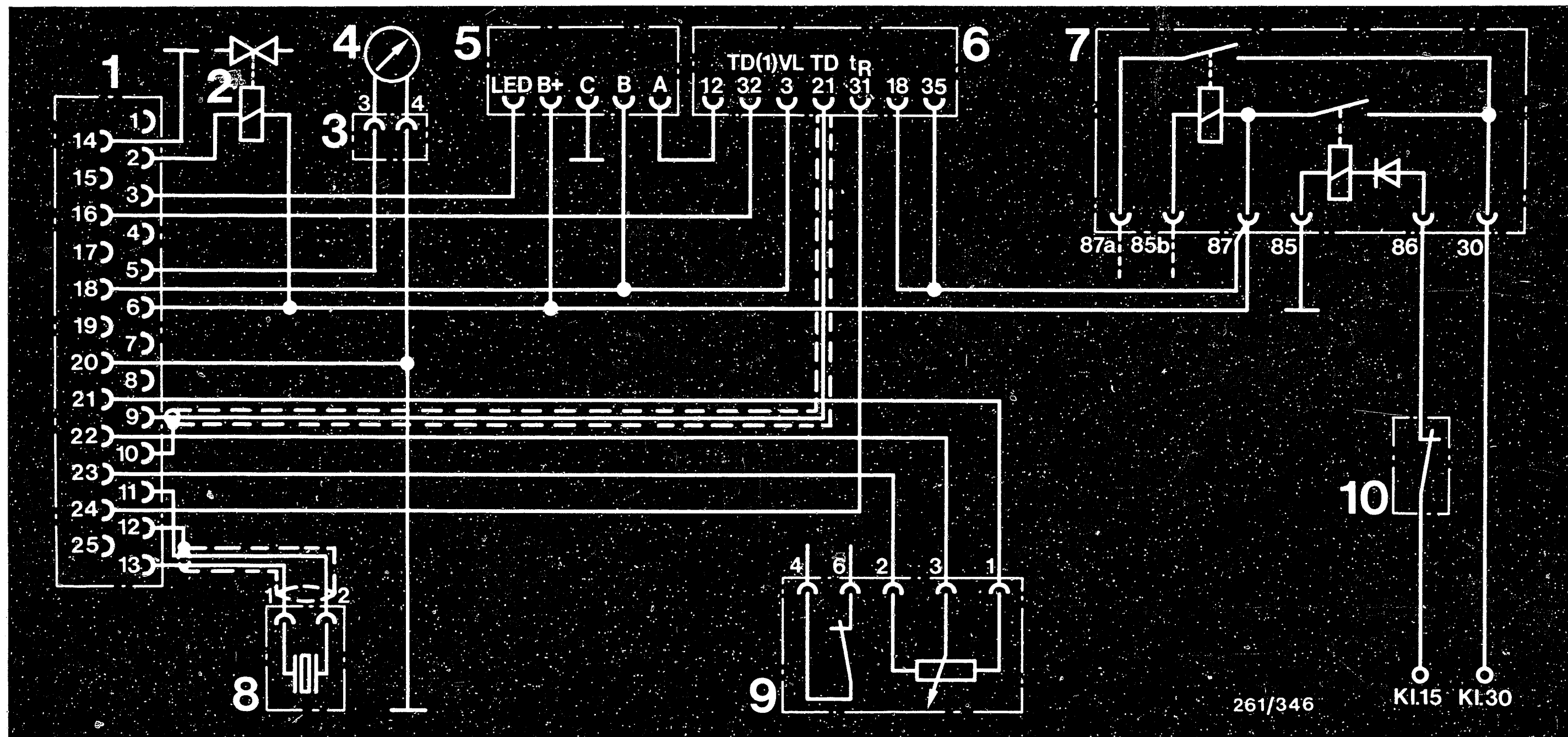
**B 23**

Voltage supply for knock-control  
device:

9 V ... U<sub>B</sub>

**B 19**





- 1 = Plug to knock control unit
- 2 = Wastegate (timing valve)
- 3 = Plug-in connection  
(4-pin, near knock control unit)
- 4 = Boost pressure gauge
- 5 = Test socket

- 6 = Motronic control unit
- 7 = Motronic relay  
(G5 in central-electrics box)
- 8 = Knock sensor
- 9 = Throttle-valve sensor  
(Idle contact for Motronic)
- 10 = Alarm system

- TD = Spark-advance angle signal output
- TD(1) = Spark-advance angle signal input
- t<sub>R</sub> = Trigger signal for knock control
- VL = Full-load signal

### 3. Electrical terminal diagram

**A4**

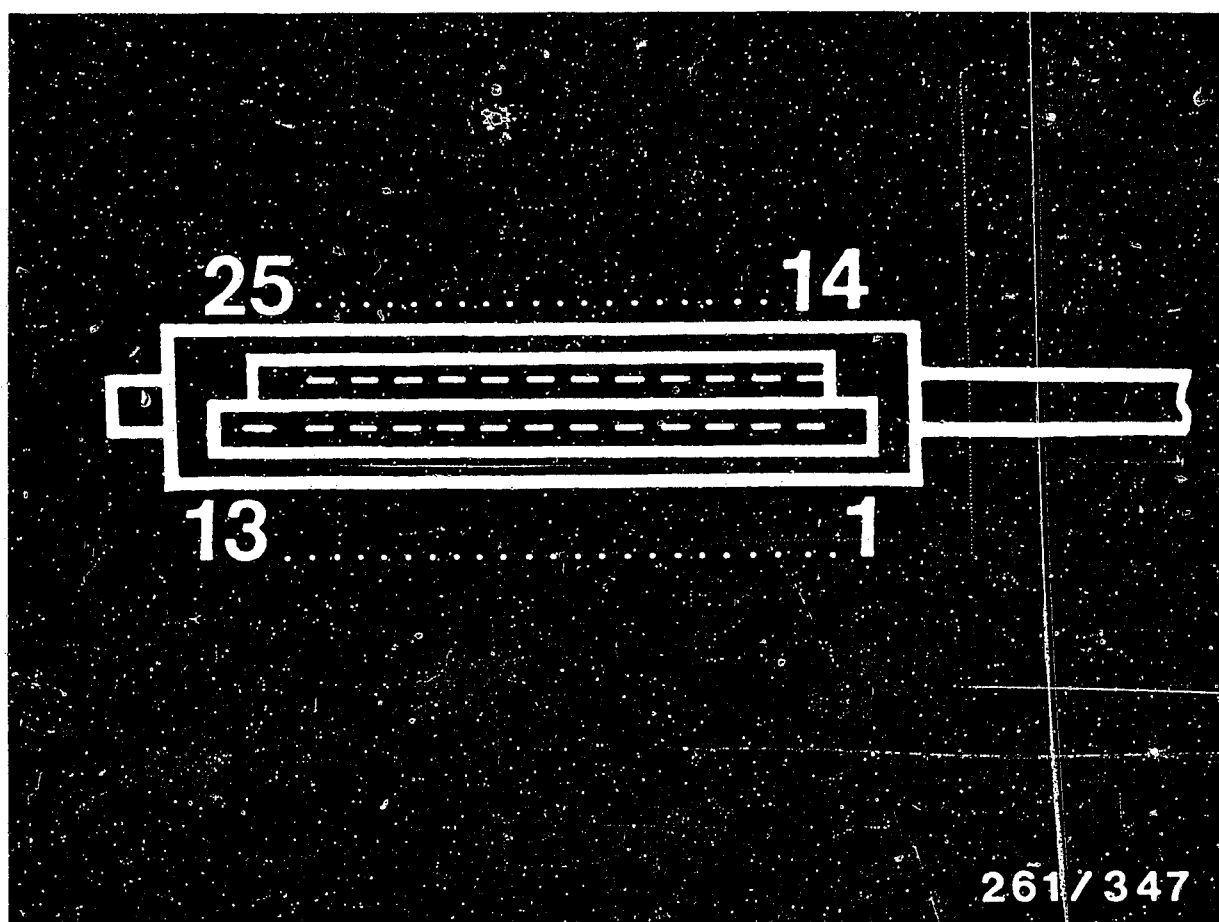
Electrical terminal diagram  
Porsche



**A5**

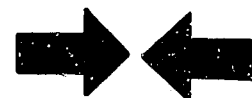
Electrical terminal diagram  
Porsche

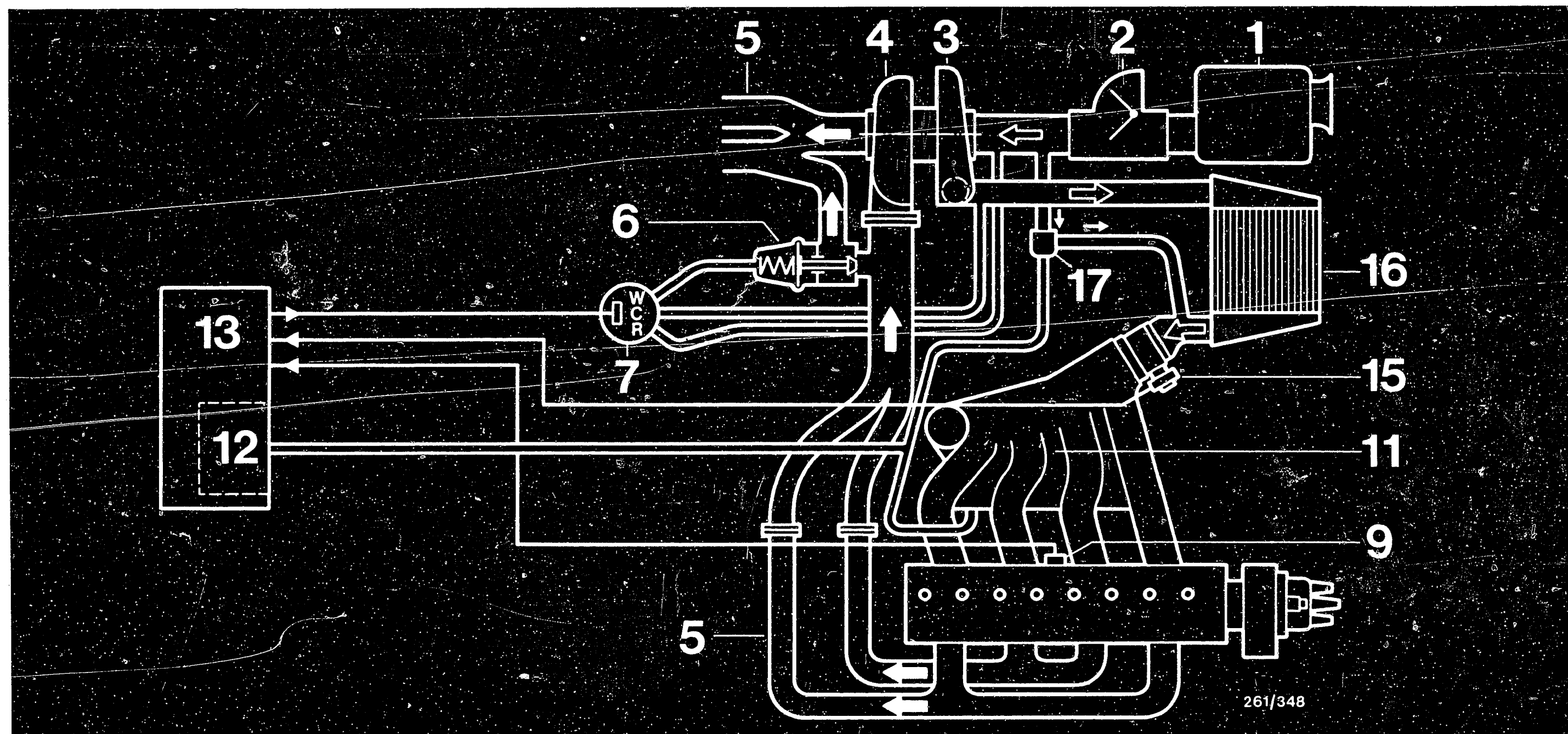




- |  |   |
|--|---|
| 1 = Not occupied                           | 15 = Not occupied                               |
| 2 = Solenoid valve, neg.                   | 16 = Spark-advance angle signal (TD(1)), output |
| 3 = LED output                             | 17 = Not occupied                               |
| 4 = Not occupied                           | 18 = Full-load function (VL)                    |
| 5 = Boost pressure gauge                   | 19 = Not occupied                               |
| 6 = Power supply, positive                 | 20 = Vehicle ground, electronics                |
| 7 = Not occupied                           | 21 = Throttle-valve potentiometer, positive     |
| 8 = Not occupied                           | 22 = Throttle-valve potentiometer, wiper        |
| 9 = Spark-advance angle signal (TD), input | 23 = Throttle-valve potentiometer, ground       |
| 10 = Ground (shield)                       | 24 = Trigger signal ( $t_R$ )                   |
| 11 = Knock sensor, ground                  | 25 = Not occupied                               |
| 12 = Knock sensor, ground shield           |   |
| 13 = Knock sensor, input                   |   |
| 14 = Vehicle ground, output stage          |   |

4. Terminal assignment diagram for knock control unit  
Top view looking onto multiple plug





1 = Air filter  
 2 = Air-flow sensor  
 3 = Compressor  
 4 = Exhaust turbine  
 5 = Exhaust pipe

6 = Wastegate  
 7 = Timing valve for boost pressure control  
 9 = Knock sensor  
 11 = Intake air distributor  
 12 = Pressure sensor in knock control unit

13 = Knock control unit  
 15 = Throttle-valve sensor (potentiometer)  
 16 = Intercooler  
 17 = Bypass air valve

# 5. Basic diagram

A7

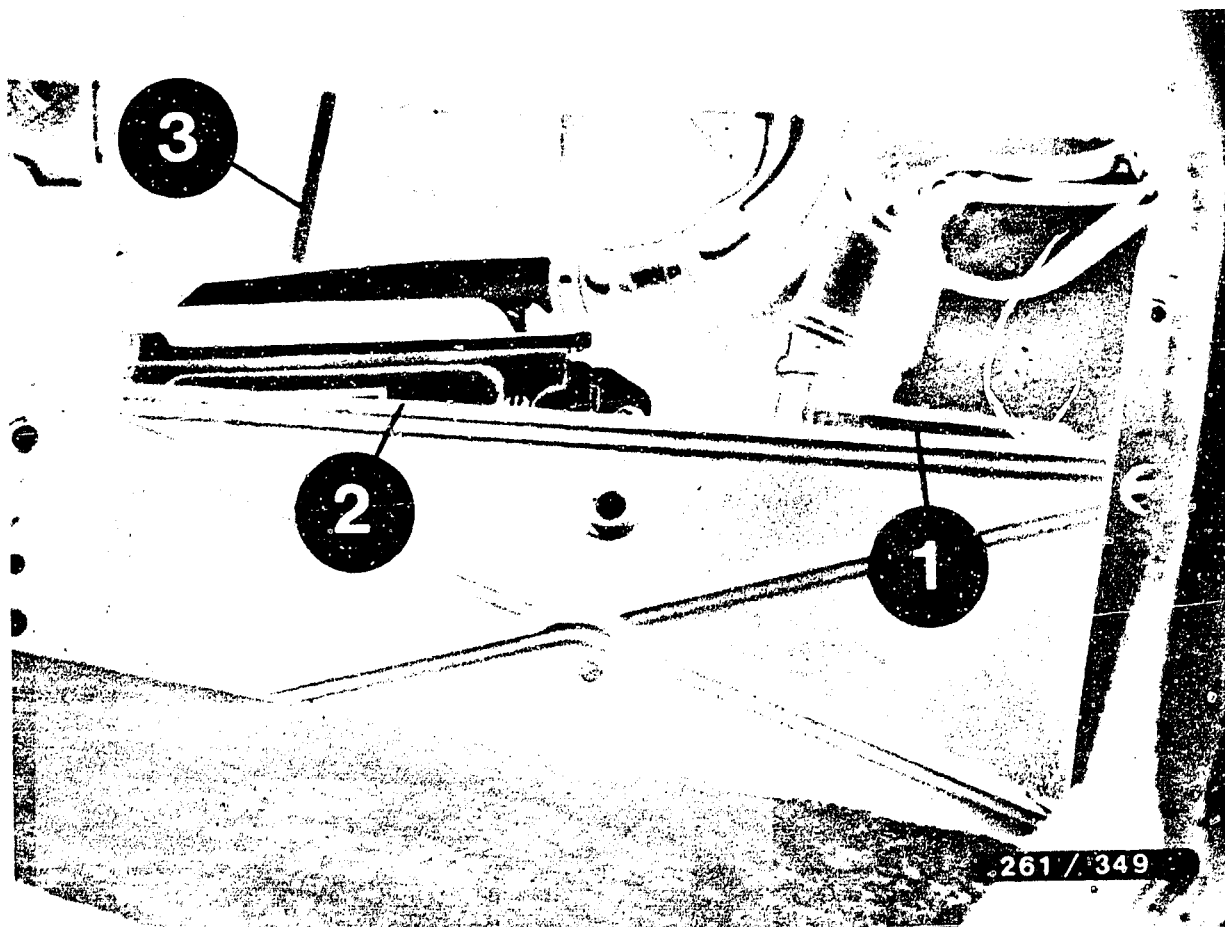
Basic diagram  
 Porsche



A8

Basic diagram  
 Porsche





- 1 = Knock control unit (25-pin plug)
- 2 = Motronic control unit (35-pin plug)
- 3 = Vacuum hose to knock control unit

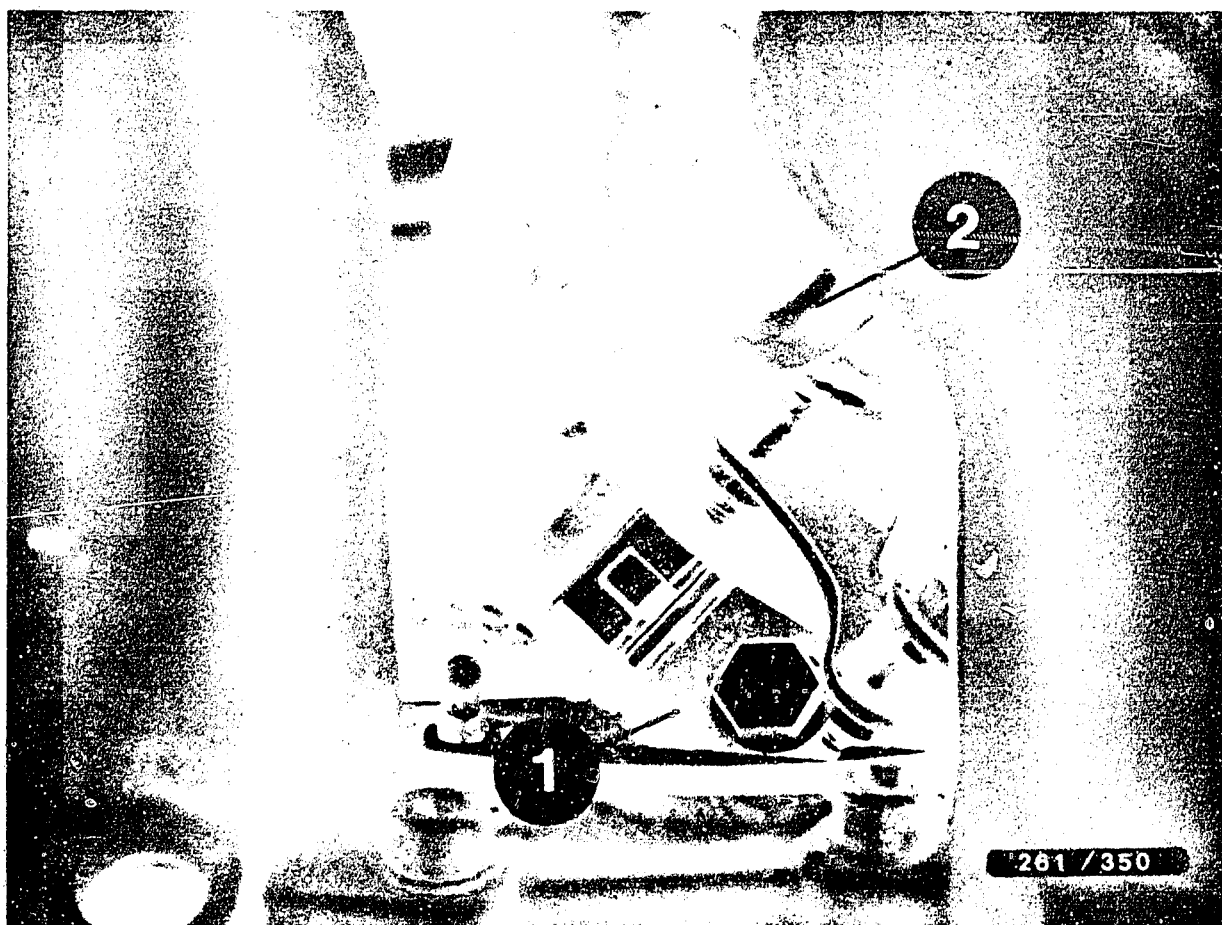
#### 6. Installation position of components

The knock control unit is behind the cover plate in the front-passenger footwell.

To disconnect the plug, loosen joint carrier plate for control units.

Vacuum hose on knock control unit must be crack-free and properly connected.





1 = Knock sensor

2 = Idle actuator

The knock sensor is mounted on the engine block under the intake air distributor between cylinders 2 and 3.

Notes on knock sensor:

Plug connection at top.

Mount knock sensor fastening screw without plain washer, spring lock washer, toothed lock washer or similar.

Tightening torque 8...10 Nm, as of model year 88: 20 Nm

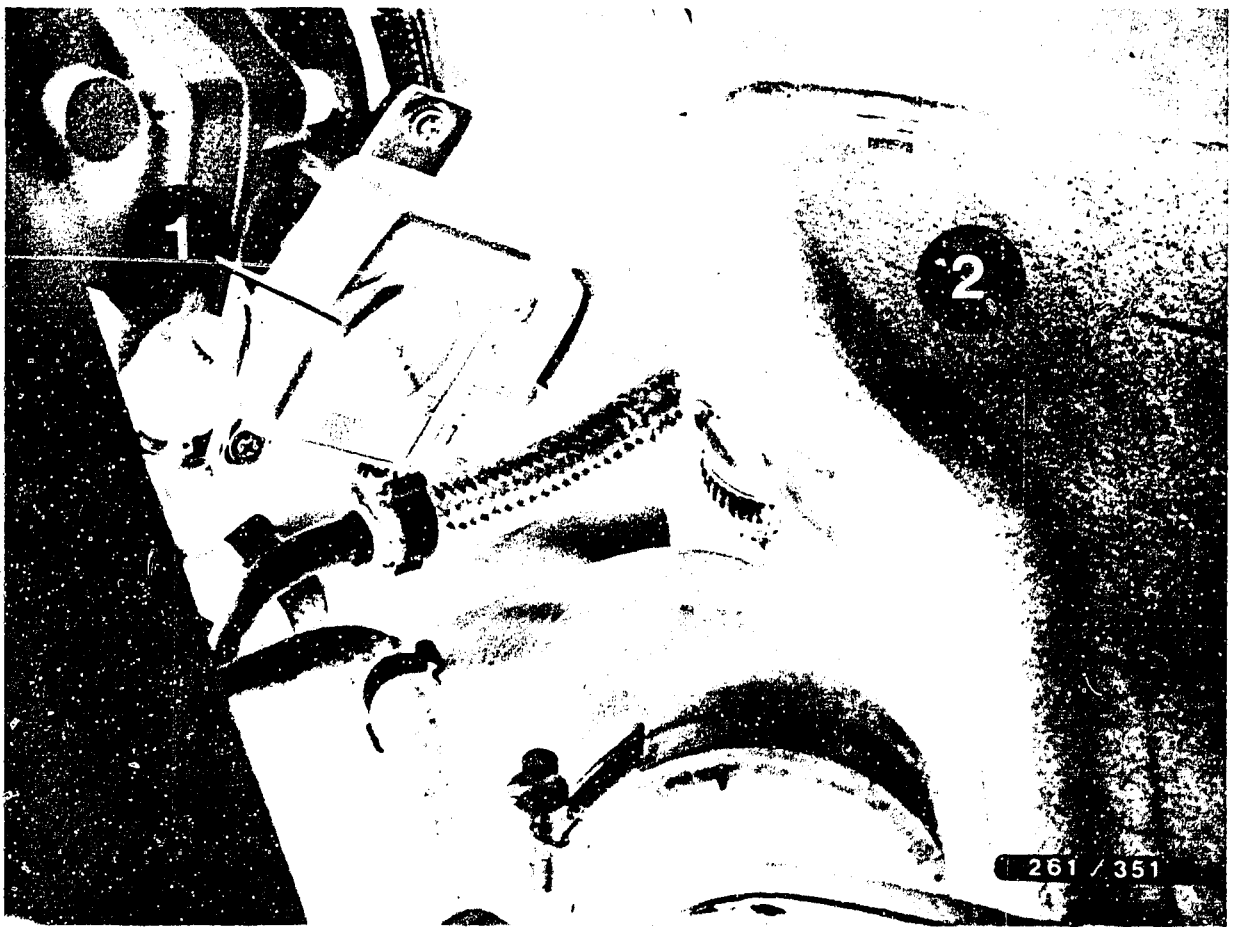
As of model year 88 the knock sensor features a continuous sleeve, thus guaranteeing a proper knock signal even with a higher tightening torque.

Secure fastening screw with locking paint only.

Knock sensor lead must be shielded and laid separately from high-tension cables.



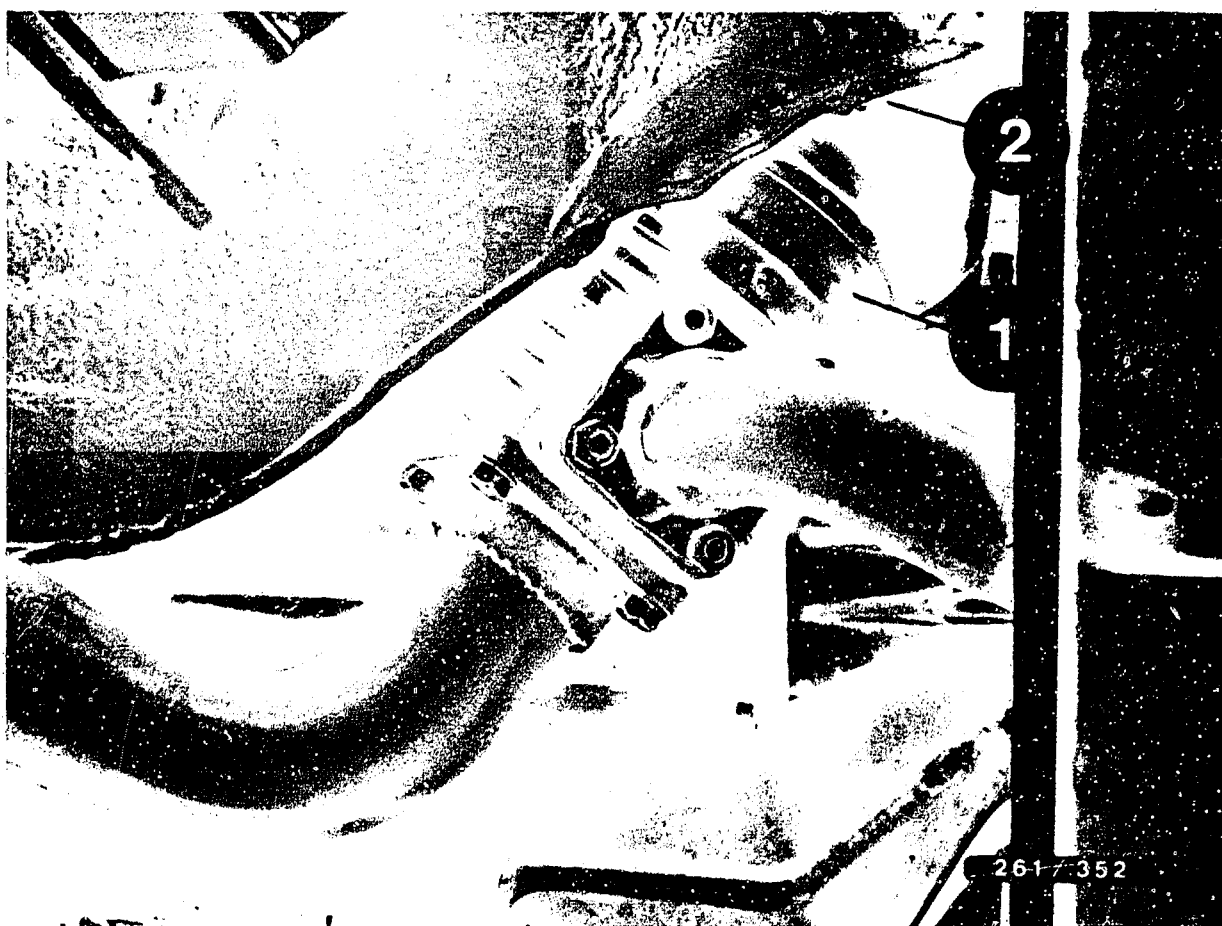




- 1 = Throttle-valve sensor
- 2 = Air filter

The throttle-valve sensor is mounted on the throttle-valve assembly. It contains a microswitch as idle contact and a potentiometer for knock control. The throttle-valve sensor is adjusted via the idle contact; this is also used for adjusting the potentiometer.

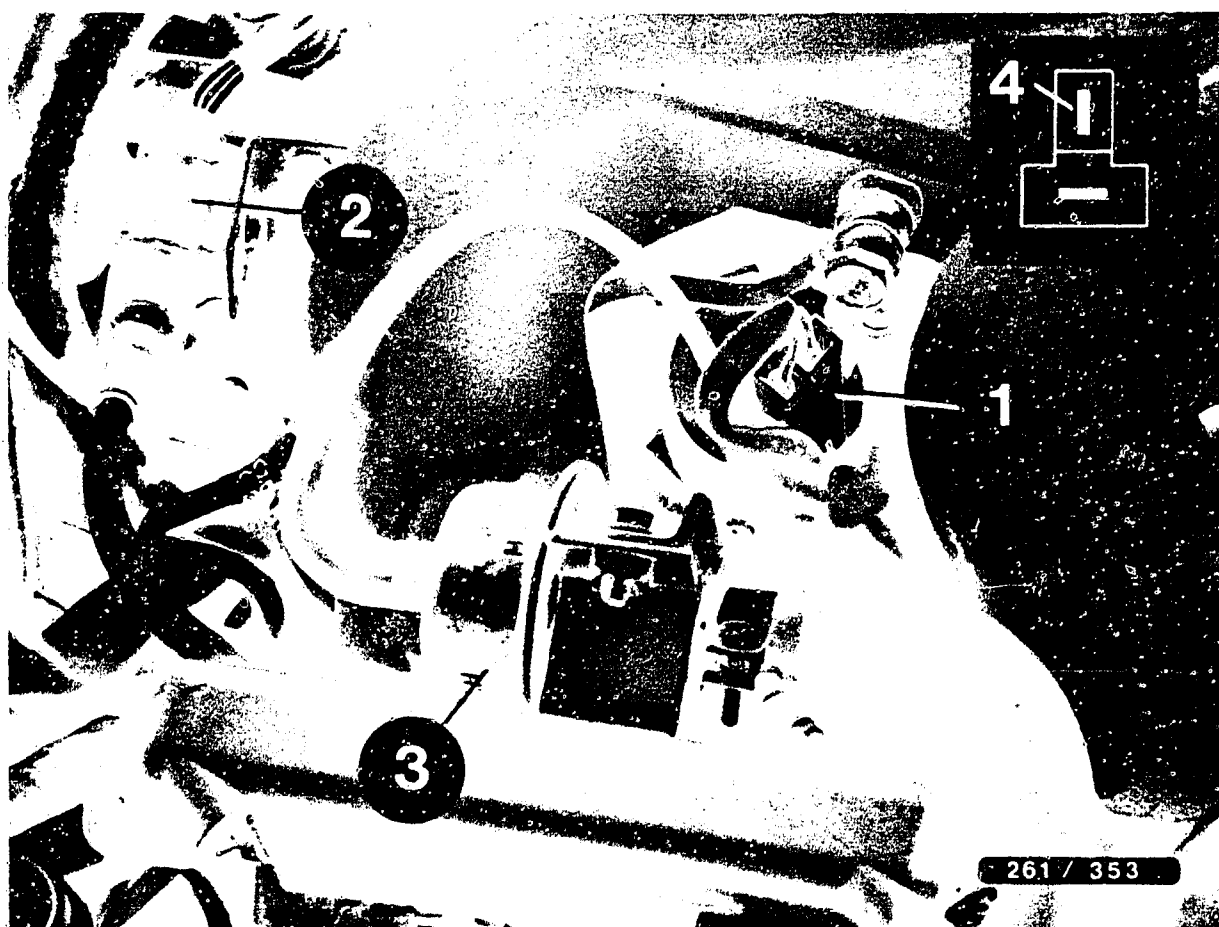




- 1 = Wastegate
- 2 = Control line to timing valve

The wastegate is on the right-hand side of the engine and is installed in the bypass line after the joining together of the two exhaust manifolds.

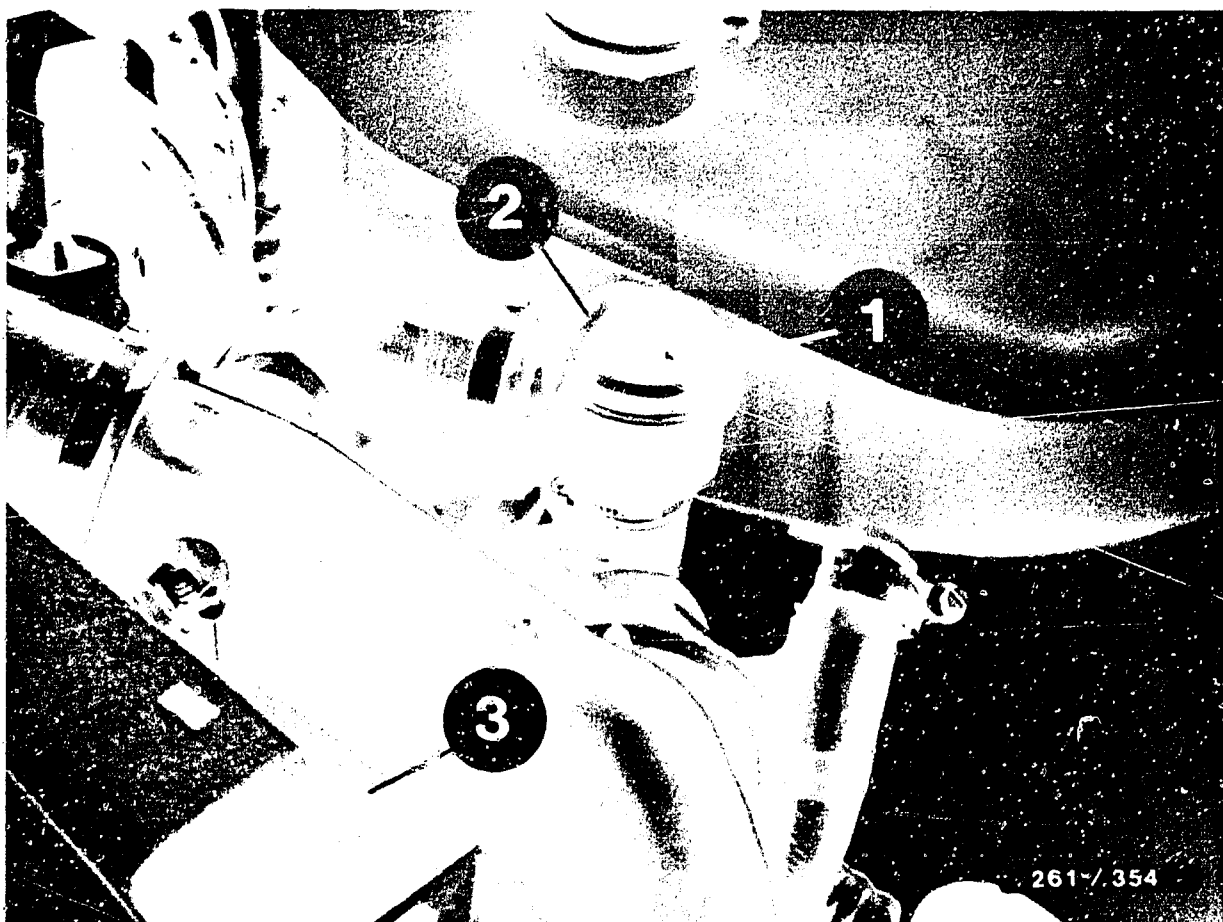




- 1 = Timing valve
- 2 = Lambda sensor plug connector
- 3 = Pressure regulator
- 4 = Negative connection on timing valve plug

The timing valve is in the engine compartment between the intake tubes of cylinders 3 and 4.





- 1 = Bypass air valve
- 2 = Control line
- 3 = Air-flow sensor

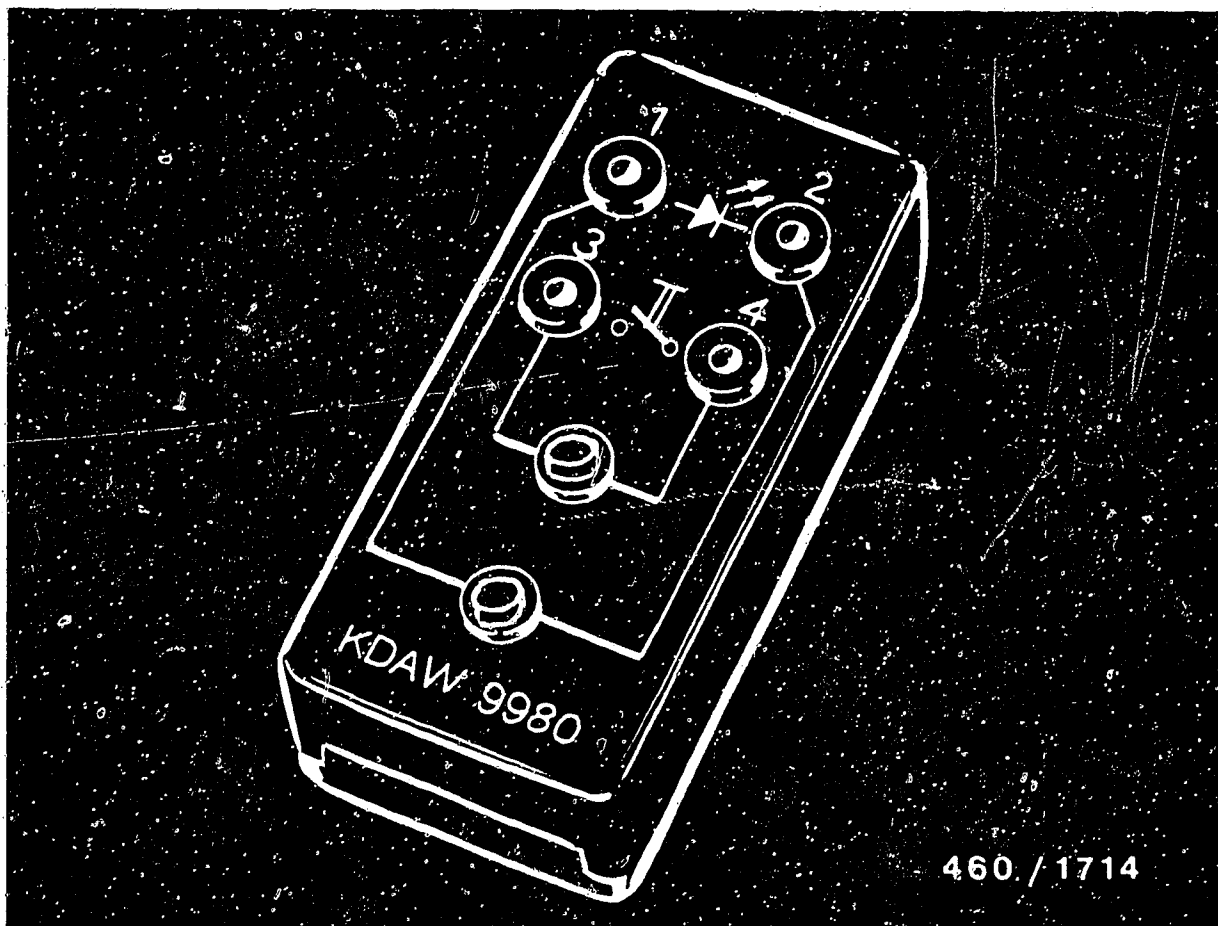
The bypass air valve is installed in the connecting piece between air-flow sensor and turbocharger (suction side). It is controlled by the intake-manifold pressure. With the throttle valve closed (high vacuum) the bypass valve opens and bypasses the compressor. There is a direct connection between suction line and pressure line of the turbocharger.



## 7. Necessary test equipment and tools

| <u>Description</u>  | <u>Designation</u>  | <u>Part No.</u>  |
|---|---|--|
| Motortester   | e.g. MOT 300<br>and MOT 400<br>or MOT 201<br>e.g. MMD 301 | 0 684 000 300<br>0 684 000 400<br>0 684 000 201<br>0 684 500 301                         |
| Digital multimeter<br>or<br>multi-range meter<br>(internal resistance<br>min. 20 k $\Omega$ /V) |   | commercially<br>available<br>e.g. Fluke<br>multimeter<br>23 or 27                        |
| Torque wrench<br>Range 5...60 Nm  |   | Commercially<br>available  |
| Screw locking paint<br>30 g for knock sensor  |   | Kk 26v9  |
| Pressure/vacuum pump<br>e.g. from Korinth<br>Ludwig-Kloos-Str. 21<br>6450 Hanau 7-Steinheim     |   | Mityvac-Duo<br>Commercially<br>available<br>Gauge pressure<br>1.5 bar<br>Vacuum 600 mbar |





Evaluation unit KDAW 9980  
for self-diagnosis flashing  
code

Test lead  
for correct connection of testers  
at component plugs (blade terminal  
connections)

KDZS 0004  
(2.8 mm wide)  
KDZS 0005  
(6.3 mm wide)



## 8. Important general information

Knock control and Motronic are operationally connected. Therefore, special instructions for the Motronic have also been included.

This information must under all circumstances be observed in order to prevent damage to engine, control unit and ignition coil and also to prevent risk to persons.

1. Never start engine without battery securely connected.

2. Incorrect polarity of the supply voltage, e.g. through incorrect connection of battery or ignition coil, may lead to destruction of the control unit.

3. Do not use a fast charger for starting the engine.

Provide starting assistance using second 12 V battery and jump leads only.

### Caution:

Do not use 24 V batteries for starting assistance.  
Follow vehicle owner manual.

4. Disconnect battery from vehicle electrical system before fast charging. Follow operating instructions for fast charger.



5. Do not disconnect battery from electrical system with engine running.

6. Do not short-circuit ignition coil terminal 1 to ground (e.g. for switching off the engine). Ignition coil and possibly control units will be destroyed.

7. No battery + may be connected to ignition coil terminal 1. Control unit will be destroyed.

8. Never disconnect or connect wiring harness plugs of control units with ignition on.

9. Remove control units at temperatures above +80°C (paint-drying installation).

10. Remove control units before carrying out welding work (electric spot welding).

11. When testing compression, disconnect Motronic relay. This prevents undesired injecting of the injection valves and prevents fire hazard.

12. If an alarm system is installed, follow installation instructions for Motronic vehicles or SIS microcard KFZ 012.

13.

CAUTION!

High-energy ignition system;  
dangerous voltages on both  
primary and secondary sides!



Touching live parts or terminals can be extremely dangerous (both on the primary and secondary sides).





## 9. Trouble-shooting chart

### Customer complaint (fault symptoms)

The causes listed in the table are covered by the detailed trouble-shooting starting on Coordinate B 3.

| 1. Engine fails to start or starts only with difficulty<br>2. Engine starts but then dies again<br>3. Rough engine idle, idle speed incorrect<br>4. Poor throttle take-up<br>5. Engine missing under all operating conditions<br>6. Fuel consumption too high<br>7. No maximum engine power<br>8. CO concentration at idle too high |  |  |   |   |   |   |  | Cause  | Coordinates |
|---|--|--|---|---|---|---|--|--|-------------|
| ●   |  |  |   |   |   |   |  | No spark-advance angle signal input (TD(1))            | B 19        |
|   |  |  | ● |   |   | ● |  | Knock control unit monitoring circuit tripping         | B 3         |
|   |  |  |   |   |   | ● |  | No full-load function (knock control unit defective)   | C 3         |
|   |  |  |   | ● |   |   |  | Loose contact at plug-in connections                   | ----        |
|   |  |  | ● | ● |   | ● |  | Timing valve not pulsing (deenergized)                 | B 3, B 23   |
|   |  |  | ● |   |   | ● |  | Bypass air valve not closing                           | C 7         |
|   |  |  | ● | ● |   | ● |  | Wastegate not opening (injection pulses being cut off) | B 3, C 5    |
|   |  |  | ● |   |   | ● |  | Throttle-valve potentiometer not supplying any voltage | B 3, B 15   |
|   |  |  | ● |   |   | ● |  | No trigger signal $t_R$ from Motronic control unit     | B 5         |
|   |  |  | ● |   |   | ● |  | Knock sensor defective                                 | B 3, B 11   |
| ●   |  |  |   |   |   |   |  | No power supply to knock control unit                  | B 19        |
| ●   |  |  | ● | ● | ● | ● |  | Knock control unit defective                           | B 3, B 19   |

**B1**

Trouble-shooting chart  
Porsche



**B2**

Trouble-shooting chart  
Porsche



## 10. Detailed trouble-shooting

The trouble-shooting program starts with the evaluation of the self-diagnosis.

### 10.1 Principle of self-diagnosis:

The knock control unit contains a testing and monitoring program for preventing engine damage due to knocking through failures in the area of knock detection and load measuring.

If knock detection is no longer guaranteed, the spark-advance angle is retarded and the boost pressure is lowered to its smallest value.

The knock control unit stores the fault as long as the ignition remains on.

Effects on driveability are:

Poor acceleration and no maximum engine power.

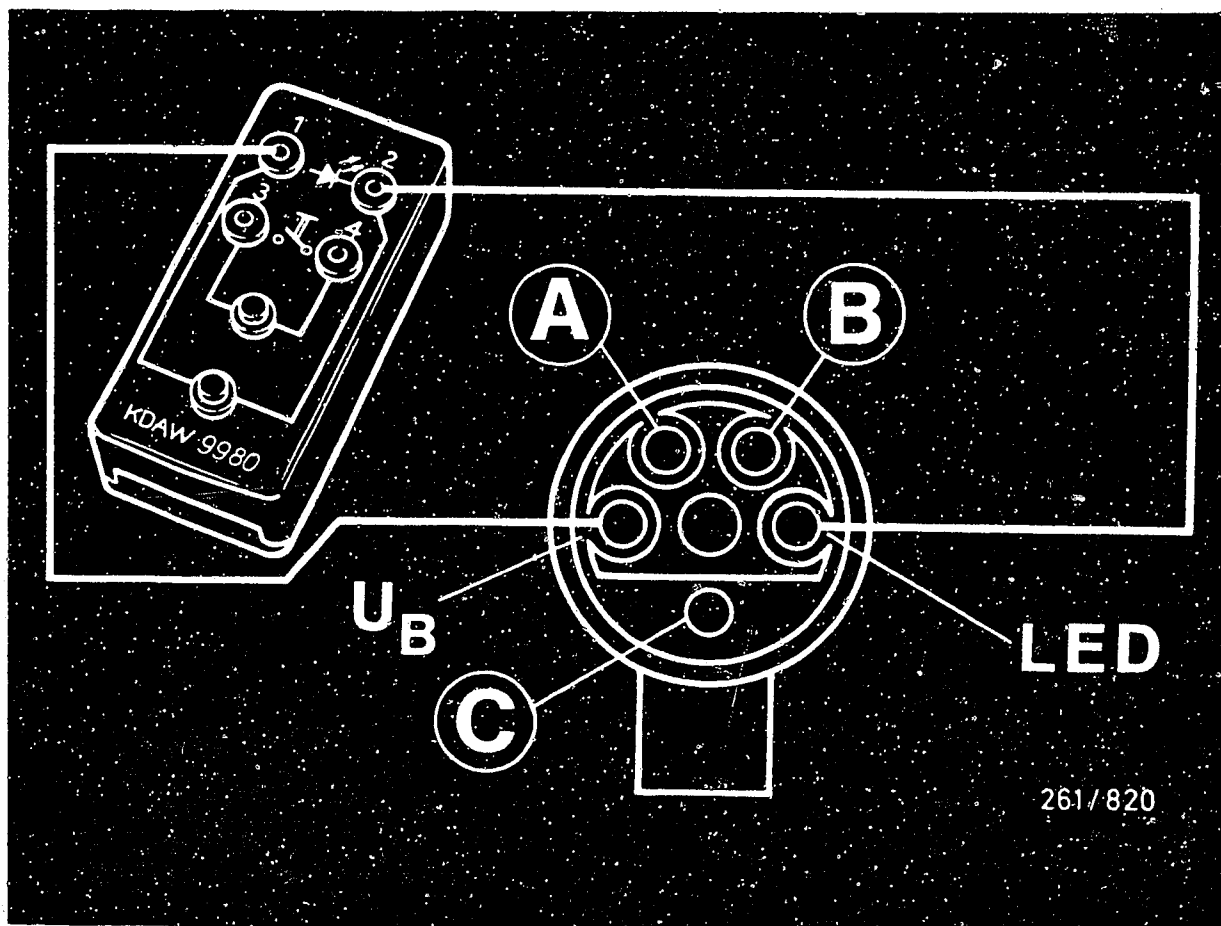
The engine will not start if spark-advance angle signal TD (1) from the knock control unit is missing.

Causes: No power supply to knock control unit, knock control unit plug not connected or knock control unit defective.

Faults (e.g. boost pressure too high) which occur only in vehicle operation must, if necessary, be re-established on the chassis dynamometer or in vehicle operation. Do not switch ignition off. Start with evaluation of self-diagnosis with engine idling.

The leads, plug connections and hoses still have to be tested even if no flashing code is output. This applies in particular to the flashing code 3-1 and 3-2.





Test socket on left in engine compartment, near spring strut

#### Evaluation of self-diagnosis:

For fault indication, connect evaluation unit KDAW 9980 to test socket.

Observe polarity in picture above.

After switching on ignition, LED lights up. With engine running and if knock control free of faults, LED remains off.

Between  $750 \text{ min}^{-1}$  and  $1500 \text{ min}^{-1}$ , i.e. at idle speed, the flashing code is output if there is a fault. Above  $1500 \text{ min}^{-1}$  the LED lights continuously if there is a fault.



Switch on ignition.  
LED must light up.  
LED lit?

no

Check contacting of LED at test socket.  
LED defective.  
No power supply to knock control unit. Measure  
voltage at knock control unit plug with test leads  
KDZS 0004.  
Between term. 6 (+) and term. 20 (-).  
Specification: greater than 9 V  
Knock control unit defective.

yes

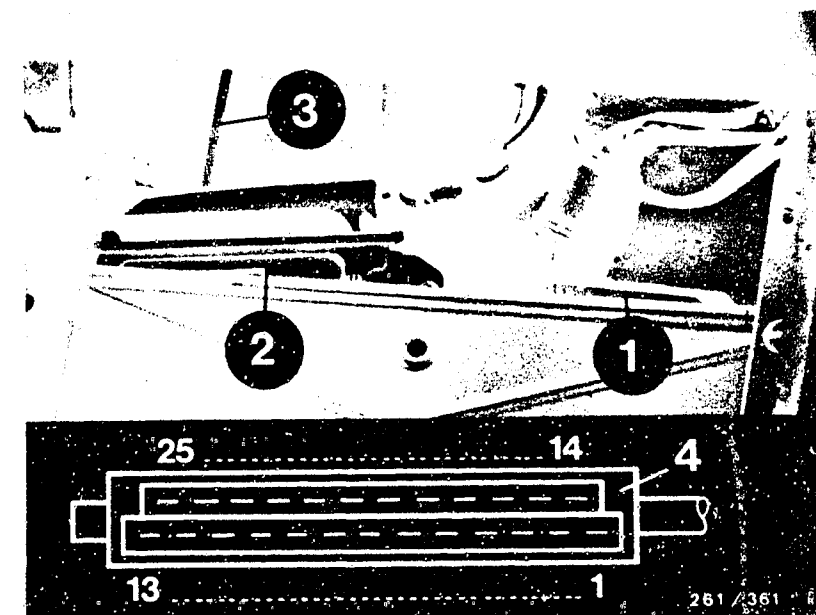
Start engine and run at idle  
speed.  
LED flashing?

no

LED constantly lit:  
Idle speed greater than  $1500 \text{ min}^{-1}$ . No  $t_R$  pulses  
(see bottom graph) from Motronic control unit.  
Measure needle pulses with ignition oscilloscope  
(special input). To do this, leave plug connected  
on control unit, but remove handle cover. Measure  
with suitable measuring prods at term. 24 (red  
clip) and ground (black clip).  
Knock control unit defective; replace.

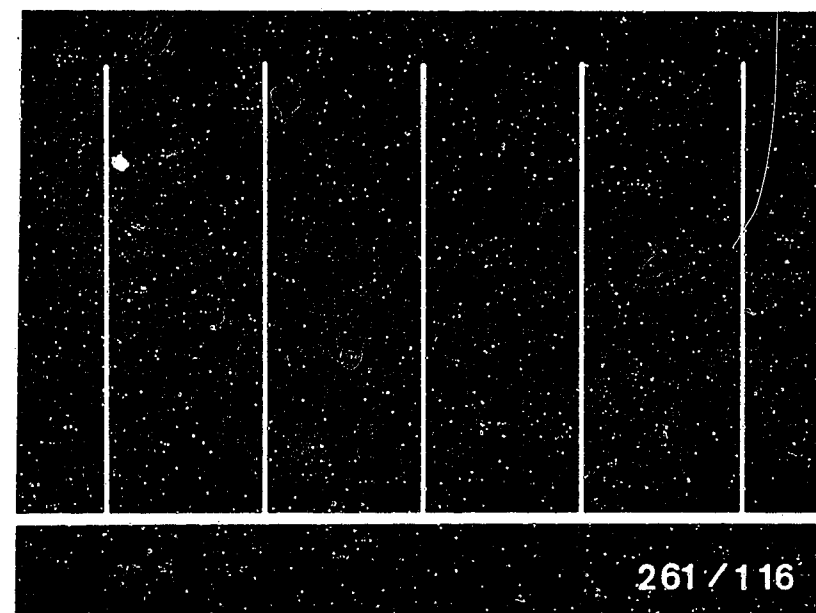
yes

Continued on next picture page



- 1 = Knock control unit
- 2 = Motronic control unit
- 3 = Vacuum hose to knock control unit
- 4 = Top view looking onto knock control unit plug

$t_R$  pulses



**B5**

Trouble-shooting (self-diagnosis)  
Porsche

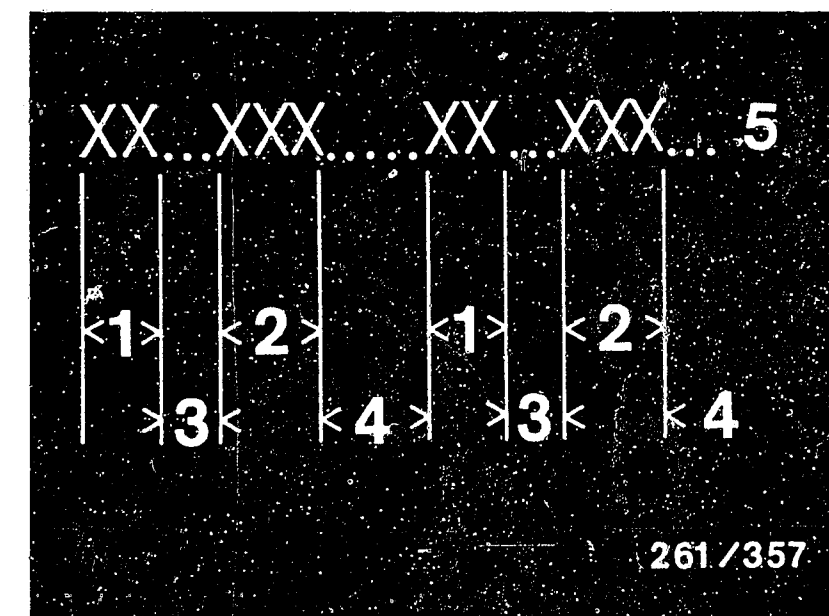


**B6**

Trouble-shooting (self-diagnosis)  
Porsche



| Flashing code | Cause  | Testing/fault rectification  | See Coordinates    |
|---------------|--|--|--------------------|
| 1 - 2         | Supply voltage less than 10.2 V  | Voltage drop across positive and ground terminals;<br>Battery discharged;<br>Alternator or regulator defective.  | B 19               |
| 2 - 1         | Knock sensor supplying too big a signal or knock control unit defective                | Engine troubles;<br>Replace knock control unit.  |                    |
| 2 - 2         | Knock sensor supplying too small a signal or no signal or knock control unit defective | Check sensor mounting (tightening torque 8...10 Nm).<br>Open circuit in lead to sensor; check sensor plug connections (oxidation);<br>Knock sensor defective;<br>Replace knock control unit. | B 11               |
| 2 - 3         | Knock control unit defec.  | Replace knock control unit.  |                    |
| 3 - 1         | Boost pressure too low   | Wastegate defective;<br>Turbocharger defective;<br>Intercooler leaking;<br>Hose to knock control unit leaking or dropped off.<br>Frequency valve not working.                                | C 5<br><br>B 23    |
| 3 - 2         | Boost pressure too high  | Wastegate defective;<br>Frequency valve not working.<br>Pressure hose to wastegate dropped off.  | C 5<br>B 23<br>A 6 |
| 3 - 3         | Pressure sensor in knock control unit defective  | Replace knock control unit.  |                    |
| 4 - 1         | Throttle-valve sensor: Wiper voltage from potentiometer too small or missing.          | Check leads and plug-in connections to potentiometer term. 1, 2 and 3.<br>Potentiometer defective.<br>No supply voltage (from knock control unit).   | B 15               |
| 4 - 2         | Throttle-valve sensor: Wiper voltage from potentiometer too great                      | Check leads to potentiometer for short circuit.<br>Potentiometer defective.  | B 15               |



Representation e.g. of flashing code 2 - 3:  
X = Lighting up of LED  
1 = Block 1 (2 x flashing)  
2 = Block 2 (3 x flashing)  
3 = Short pause  
4 = Long pause  
5 = Flashing code repeats continuously



## 10.2 Visual examination in engine compartment

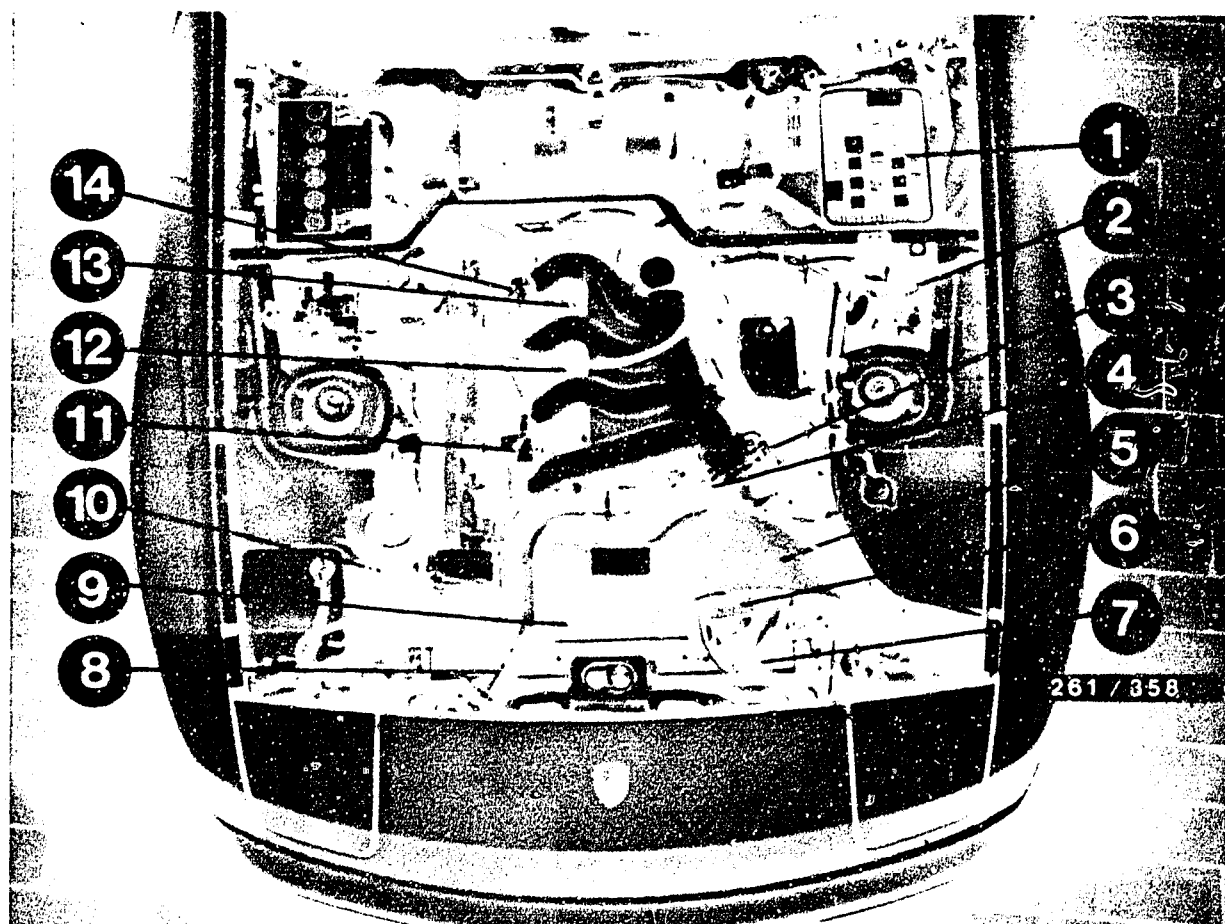
- Check that hoses of intake-air system and air hoses to knock-control device, to frequency valve and to charge-air pressure control valve as well as hoses of fuel line system are properly connected and neither kinked nor damaged.

Replace hoses if necessary.

Eliminate leaks by means of new seals or by re-tightening the connecting elements.

- Check electrical plug-in connections for corrosion damage, good contacting, loose contacts and security. The spring contacts in the plug-in connections must be latched and must not allow themselves to be pushed back.
- Hose connection between knock control unit (in front-passenger footwell) and intake manifold must be properly connected, leak-tight and must not be kinked.





- 1 = Central-electrics box
- 2 = Test socket
- 3 = Turbocharger
- 4 = Throttle-valve sensor
- 5 = Bypass air valve
- 6 = Air-flow sensor
- 7 = Pressure pipe from intercooler
- 8 = Pressure pipe from turbocharger
- 9 = Air filter
- 10 = Ignition coil
- 11 = Pressure damper
- 12 = Knock sensor
- 13 = Timing valve
- 14 = Pressure regulator

### 10.3 Overall view of engine

## 10.4 Checking the knock sensor

### Measure internal resistance of knock sensor

Switch off ignition.  
Disconnect plug from knock control unit. Connect ohmmeter (1 M  $\Omega$  measuring range) with test leads KDZS 0004 between term. 11 and term. 13 on knock control unit plug. Do not damage spring contacts.

Set value: up to approx. 9.87:  
270 ... 330 k $\Omega$   
as of model year 88:  
 $\infty \Omega$

Resistance within tolerance band

yes

As of model year 88:  
Test leads to knock sensor for open-circuit.

As described above, connect ohmmeter to term. 11 and 13. Detach plug of knock sensor and jumper with test lead.

Set value: approx. 0  $\Omega$

Is set value obtained?

yes

Continued on next picture page

no

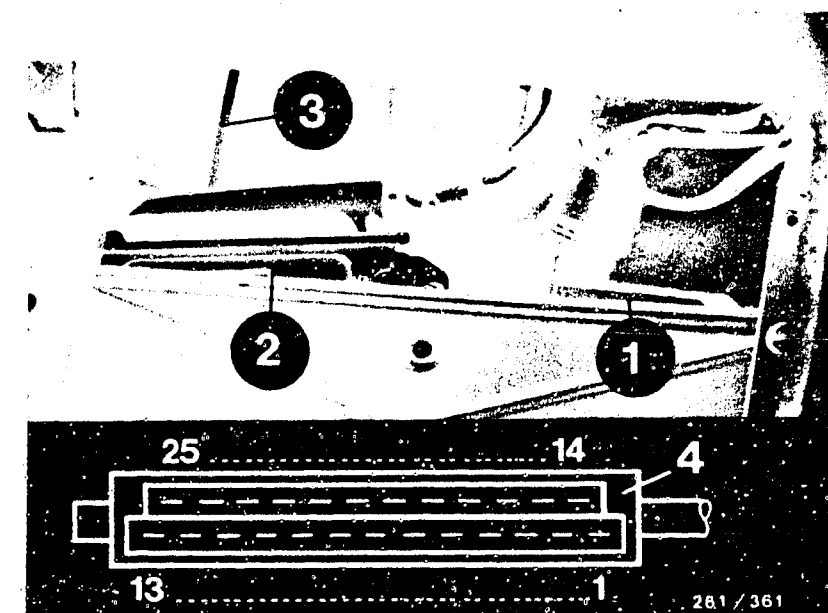
If actual value is less than set value, check whether screen (connected to term. 12) is connected - which it should not be - to term. 11 and term. 13 and whether the leads are in mutual contact.  
Repeat resistance measurement directly at knock sensor.  
Knock sensor is installed between cylinder 2 and 3.  
If knock sensor is O.K., check for corrosion on plug connections, proper seating of spring contacts and open-circuit in leads.  
Replace knock sensor if it is defective.  
Washers, spring lock washers and the like must not be used for attaching the knock sensor.  
Only secure screw with locking paint!  
Tightening torque (absolutely mandatory):

up to approx. 9.87: 8 ... 10 Nm

as of model year 88: 20 Nm

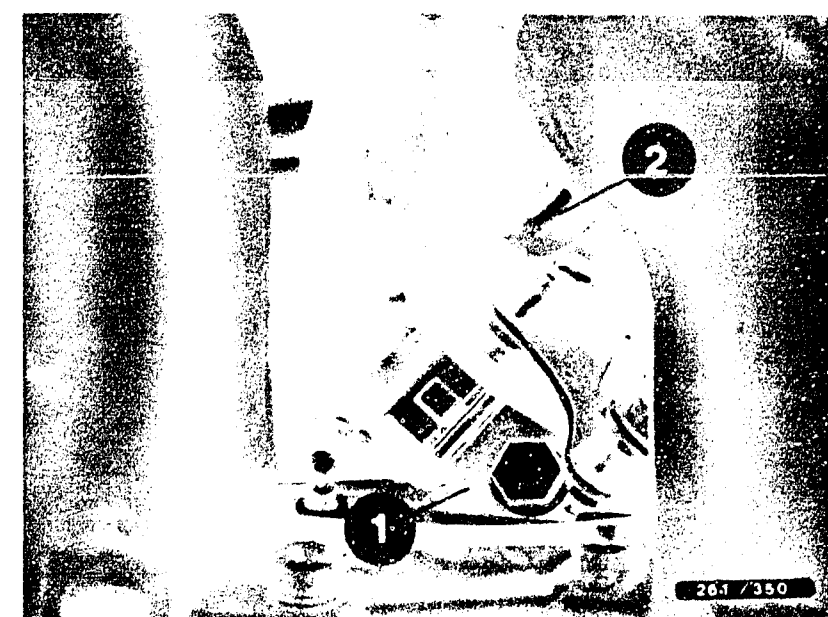
no

Check for corrosion on plug connections and proper seating of spring contacts.  
Eliminate open-circuit.



- 1 = Knock control unit
- 2 = Motronic control unit
- 3 = Vacuum hose to knock control unit
- 4 = Top view looking onto plug of knock control unit

- 1 = Knock sensor
- 2 = Idle actuator



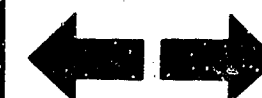
**B11**

Trouble-shooting (knock sensor)  
Porsche



**B12**

Trouble-shooting (knock sensor)  
Porsche





Checking the knock sensor (continued)

Check shielding of knock sensor.

Connect ohmmeter (1 M  $\Omega$  measuring range) between term. 12 and term. 13 on knock control unit plug.

Test specification: greater than 100 k $\Omega$

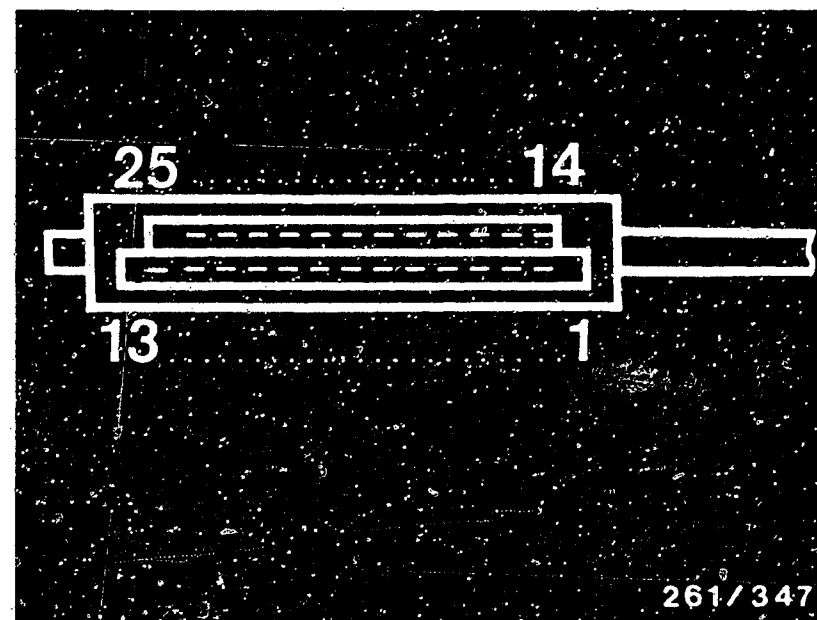
Resistance reading greater than 100 k $\Omega$ ?

no

Resistance reading less than 100 k $\Omega$ :  
Check knock sensor lead for worn spots and pinching.

yes

Continued on next picture page



Top view looking onto plug of knock control unit

**B 13**

Trouble-shooting (knock sensor)  
Porsche

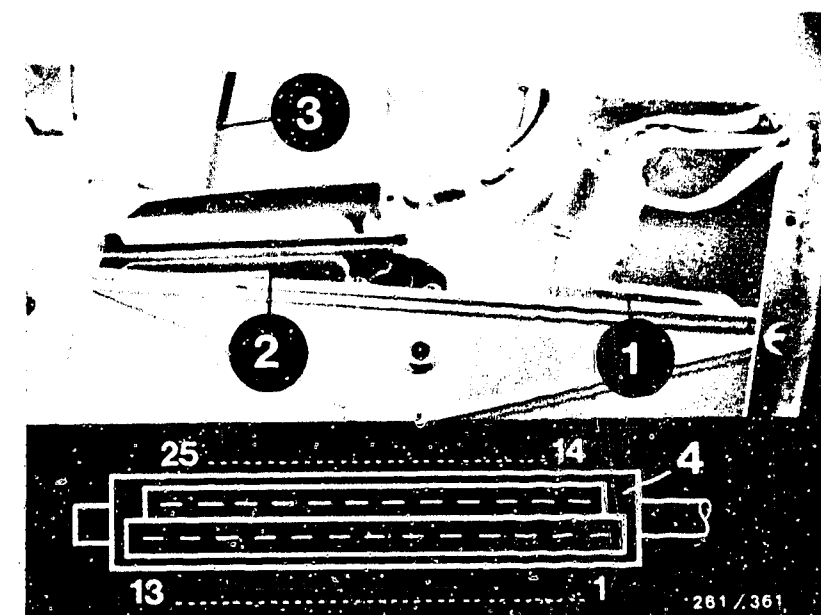
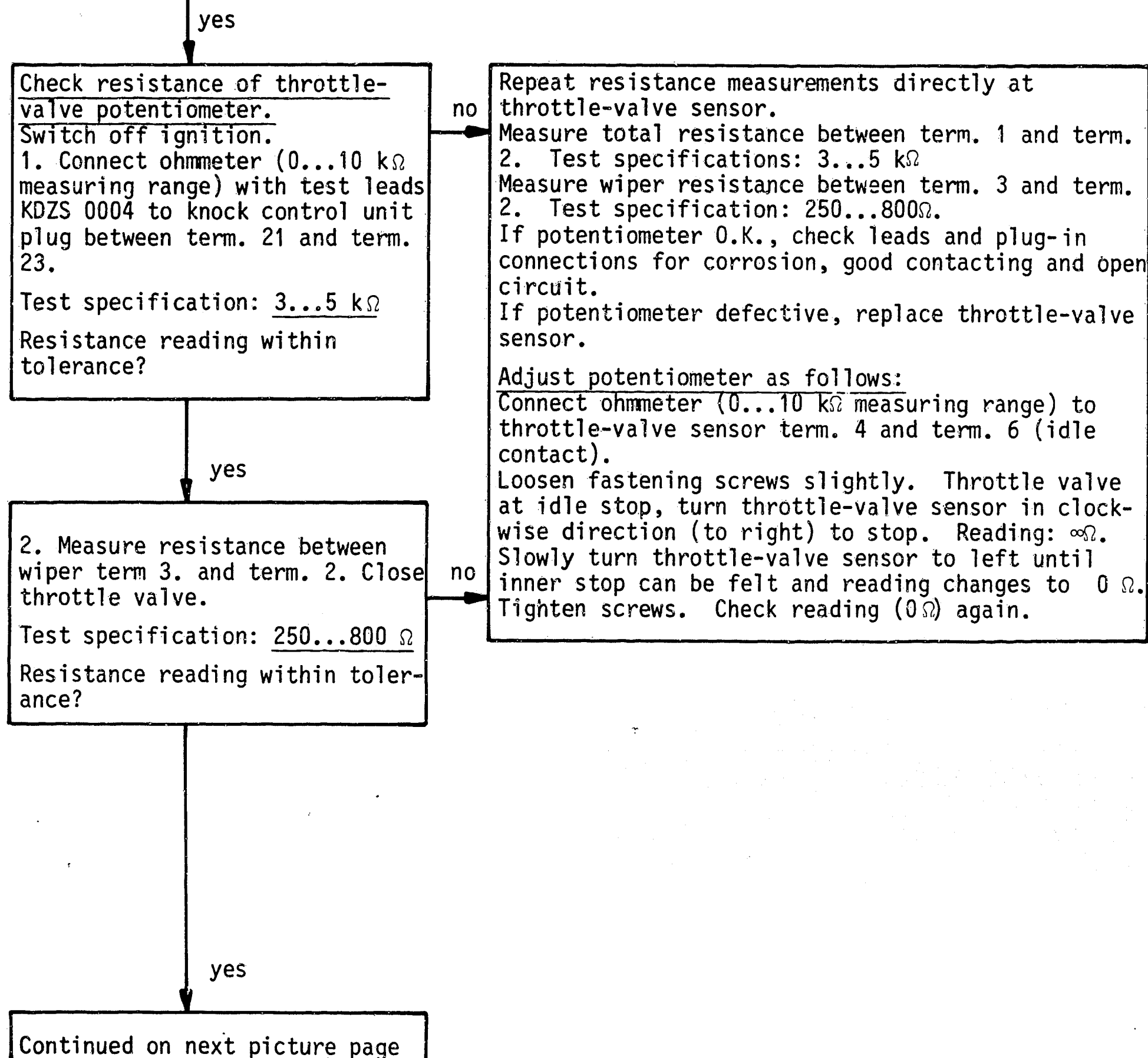


**B 14**

Trouble-shooting (knock sensor)  
Porsche

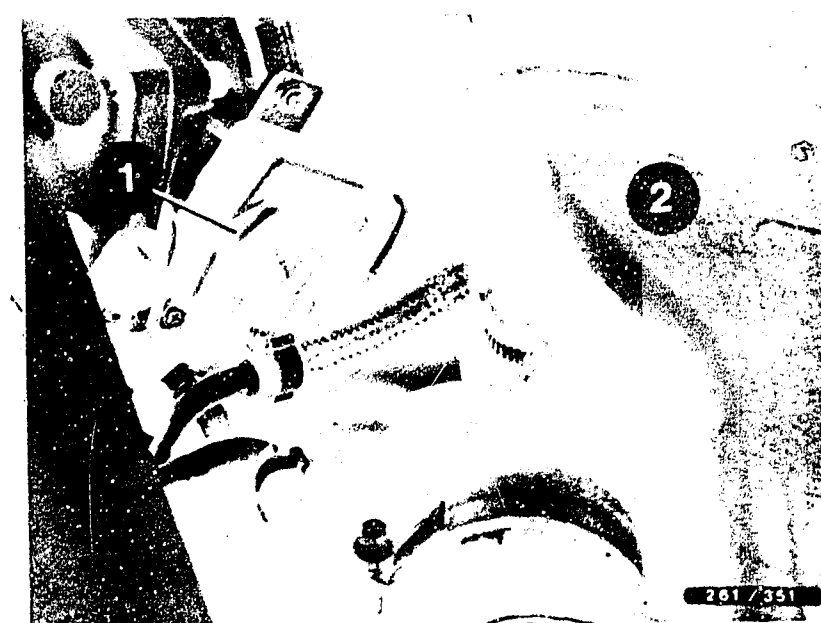


## 10.5 Checking the throttle-valve sensor potentiometer



- 1 = Knock control unit
- 2 = Motronic control unit
- 3 = Vacuum hose to knock control unit
- 4 = Top view looking onto plug of knock control unit.

- 1 = Throttle-valve sensor
- 2 = Air filter



## Checking the throttle-valve sensor potentiometer (continued)

### Measure supply voltage to throttle-valve potentiometer.

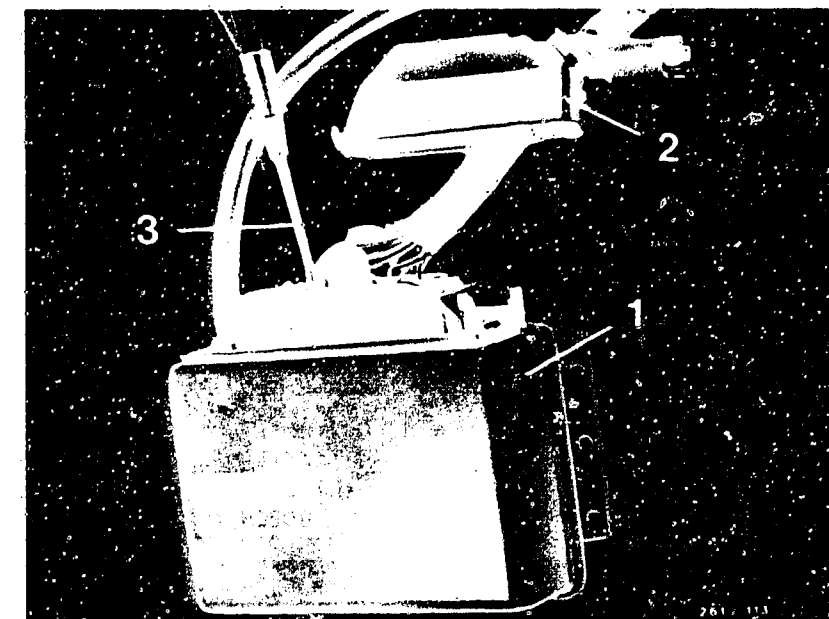
Switch off ignition.  
Disconnect plug from knock control unit and remove handle cover from plug.  
Re-connect plug to knock control unit.  
Switch on ignition.  
Connect voltmeter with suitable test prods to terminals 21 (+) and 23 (-).  
Test specification: 3.6...4.4 V  
Voltage within tolerance?

no Replace knock control unit.

### Measure wiper voltage of throttle valve potentiometer.

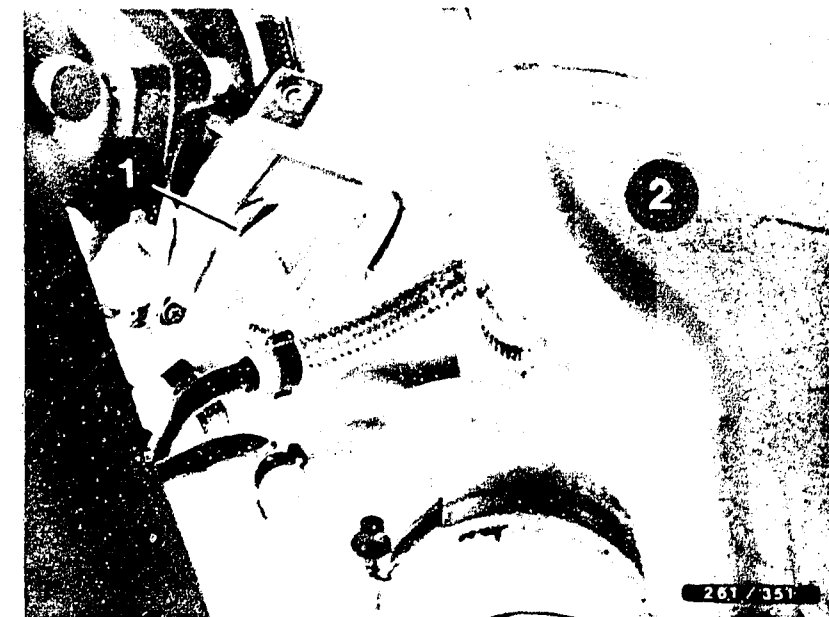
Switch on ignition.  
Hold voltmeter with suitable test prods against terminals 22 (+) and 23 (-) of knock control unit plug.  
Throttle valve at idle stop.  
Test specification: 0.35...0.62 V  
Voltage within tolerance?  
Check measurement:  
Turn throttle valve to full-load stop.  
Voltage rises to 3.3...4.3 V

no  
Adjust throttle-valve potentiometer as follows:  
Switch off ignition.  
Disconnect plug from throttle-valve sensor.  
Connect ohmmeter (0...10 k $\Omega$  measuring range) to throttle-valve sensor term. 4 and term. 6 (idle contact).  
Loosen fastening screws slightly.  
Throttle valve at idle stop, turn throttle-valve sensor in clockwise direction (to right) to stop.  
Reading:  $\infty\Omega$ .  
Slowly turn throttle-valve sensor to left until inner stop can be felt and reading changes to 0  $\Omega$ .  
Tighten screws. Check reading (0 $\Omega$ ) again.  
If adjustment not possible, check throttle-valve stop or replace throttle-valve sensor.



1 = Knock control unit  
2 = Handle cover  
3 = Test prod

1 = Throttle-valve sensor  
2 = Air filter



## 10.6 Checking the knock control unit

Check supply voltage to knock control unit.

Switch off ignition.

Disconnect plug from knock control unit.

Connect voltmeter with test leads KDZS 0004 to knock control unit plug between term. 6 (+) and term. 20 (-). Do not damage spring contacts. Switch on ignition.

Test specification: 10.2...15.0 V

Voltage present?

no

Check plug-in connections and leads from knock control unit term. 6 to Motronic relay term. 87 and from knock control unit term. 20 to ground terminal for corrosion, good contacting and open circuit. Measure voltage at term. 87 from Motronic relay. No voltage present: replace relay.

yes

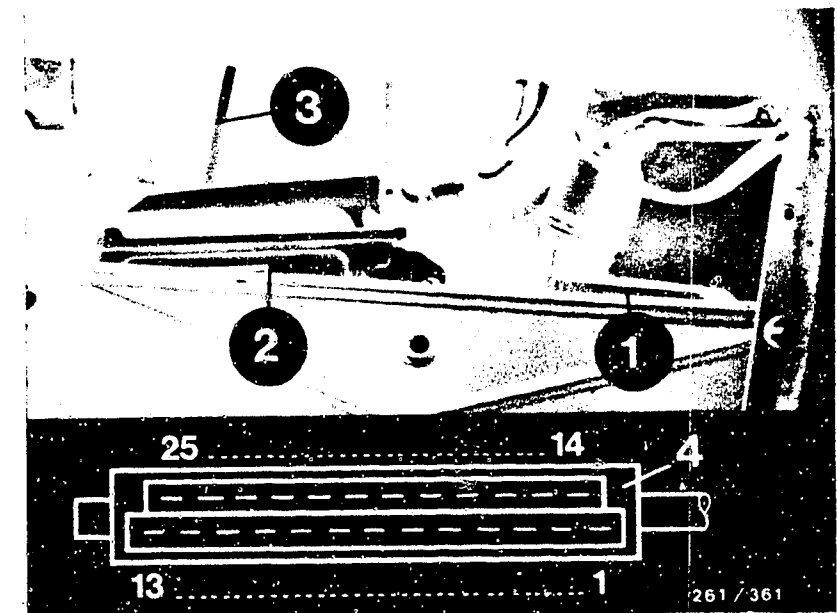
Switch off ignition.

Remove handle cover from knock control unit plug.

Connect plug to knock control unit. Check spark-advance angle signals TD (input) and TD (1) (output).

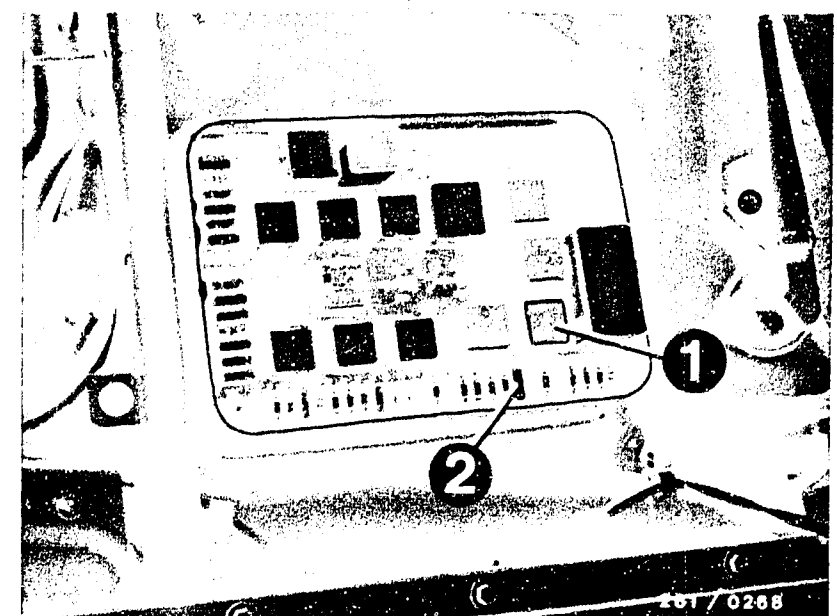
These checks can be omitted if engine running.

Continued on next picture page

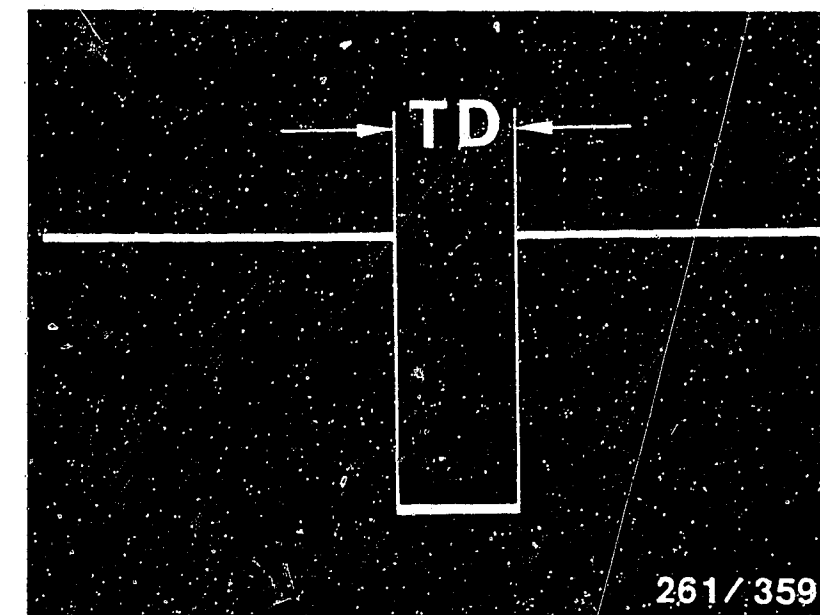
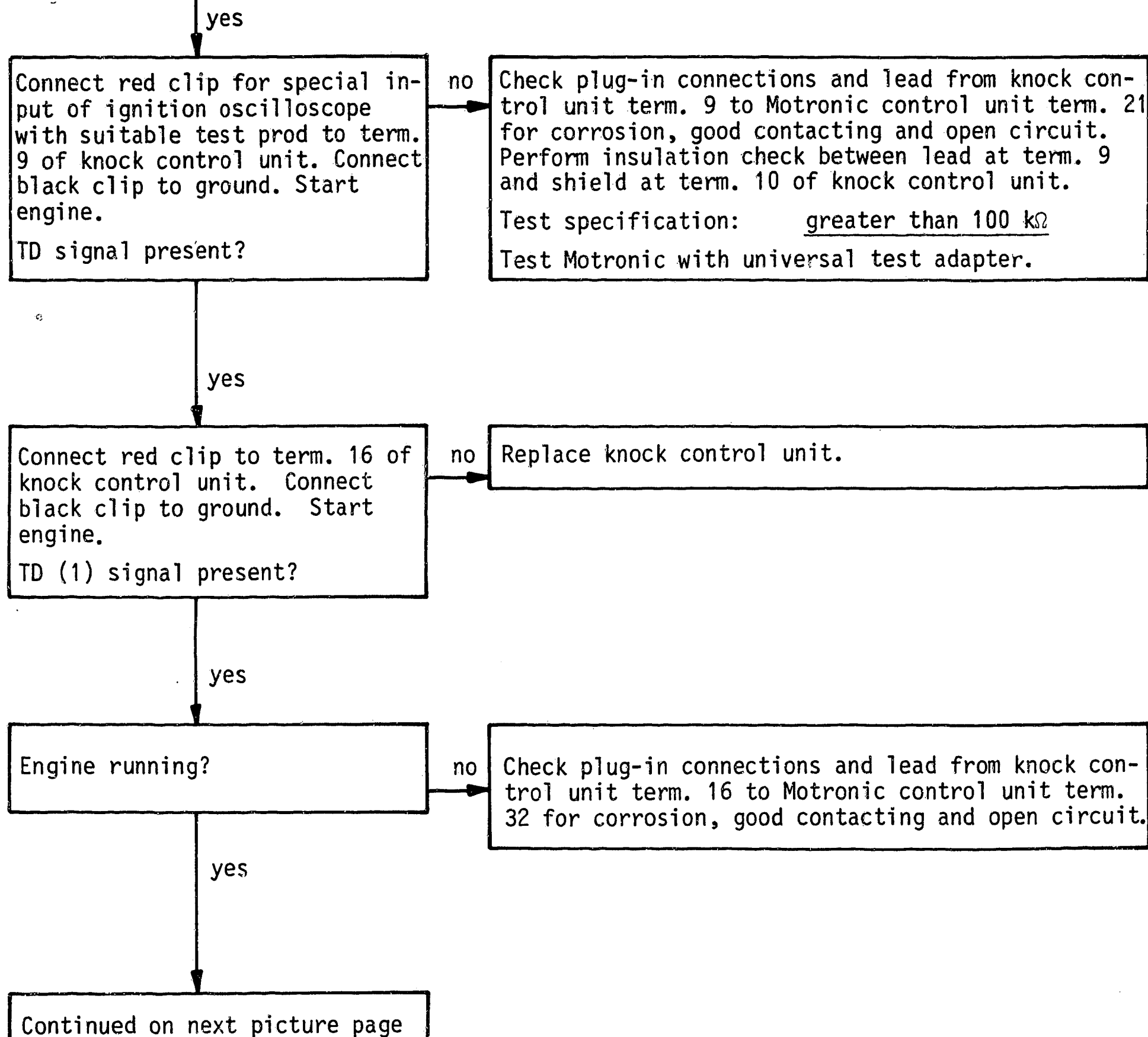


- 1 = Knock control unit
- 2 = Motronic control unit
- 3 = Vacuum hose to knock control unit
- 4 = Top view looking onto plug of knock control unit

- 1 = Motronic relay G5
- 2 = Pump fuse no. 34

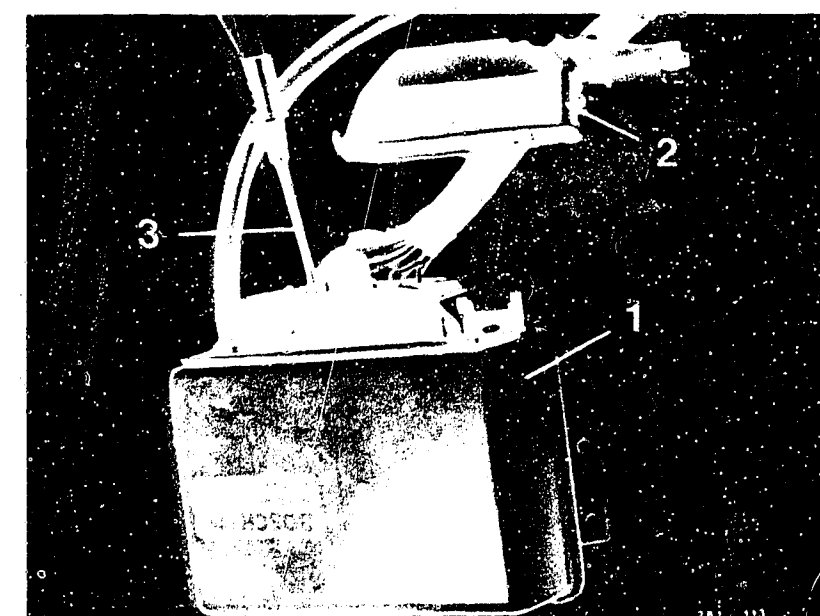


# Checking the knock control unit (continued)



Spark-advance angle signal  
TD or TD (1)

- 1 = Knock control unit
- 2 = Handle cover
- 3 = Test prod



## 10.7 Checking the timing valve

### Voltage measurement on timing valve.

Connect voltmeter with test leads KDZS 0004 to knock control unit plug term. 2 (+) and term. 20 (-).

Switch on ignition.

Test specification: 10...15 V

Voltage within tolerance?

no

Check lead from term. 2 to timing valve and from timing valve to term. 87 of main relay of Motronic for open circuit.

Check plug-in connections for corrosion, good contacting and open circuit.

yes

### Resistance measurement on timing valve.

Switch off ignition.

Connect ohmmeter (0 to 10 k $\Omega$  measuring range) with test leads KDZS 0004 to knock control unit plug between term. 2 and term. 6.

Test specification: 18...45  $\Omega$

Resistance reading within tolerance?

no

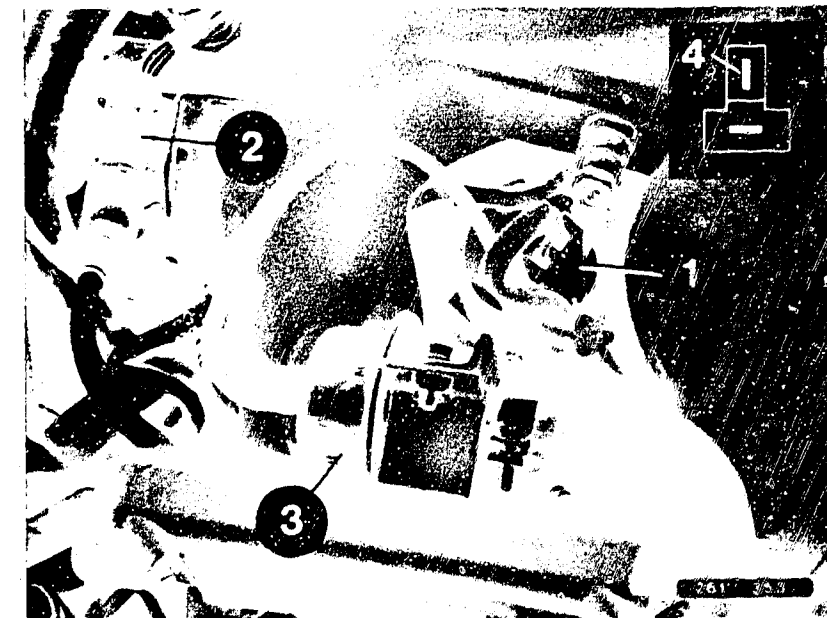
Repeat resistance measurement directly at timing valve.

Test specification: 18...45  $\Omega$

Check plug-in connections for corrosion, good contacting and open circuit.

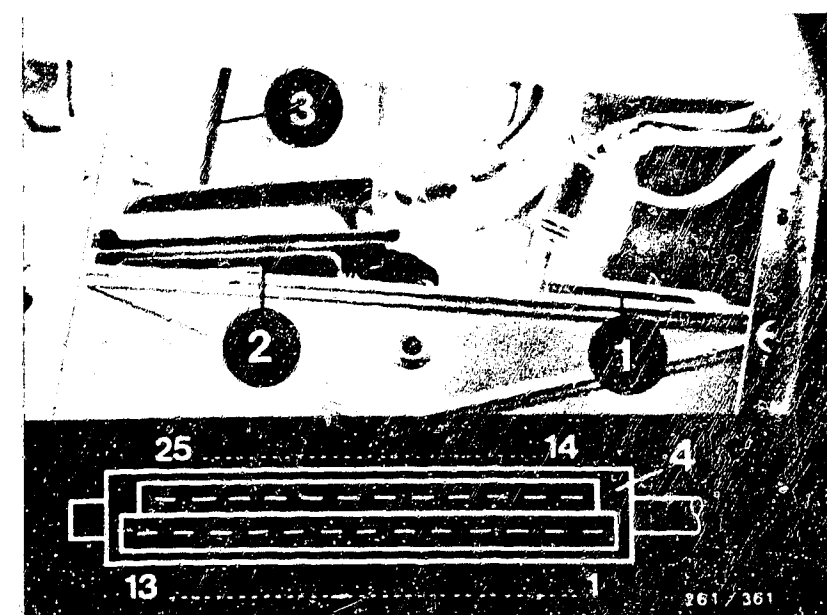
yes

Continued on next picture page



- 1 = Timing valve
- 2 = Lambda sensor plug connector
- 3 = Pressure regulator
- 4 = Negative connection on timing valve

- 1 = Knock control unit
- 2 = Motronic control unit
- 3 = Vacuum hose to knock control unit
- 4 = Top view looking onto plug of knock control unit



**B23**

Trouble-shooting (timing valve)

Porsche



**B24**

Trouble-shooting (timing valve)

Porsche



## Checking the timing valve (continued)

Measure signal at timing valve.

Switch off ignition.

Connect red clip for special input of ignition oscilloscope with suitable clamp to negative terminal of timing valve. Negative terminal leads to knock control unit term. 2.

Connect black clip to ground.

Connect knock control unit.

Run engine at idle.

Observe signal on oscilloscope (see bottom picture "a"):

Signal present?

no Replace knock control unit.

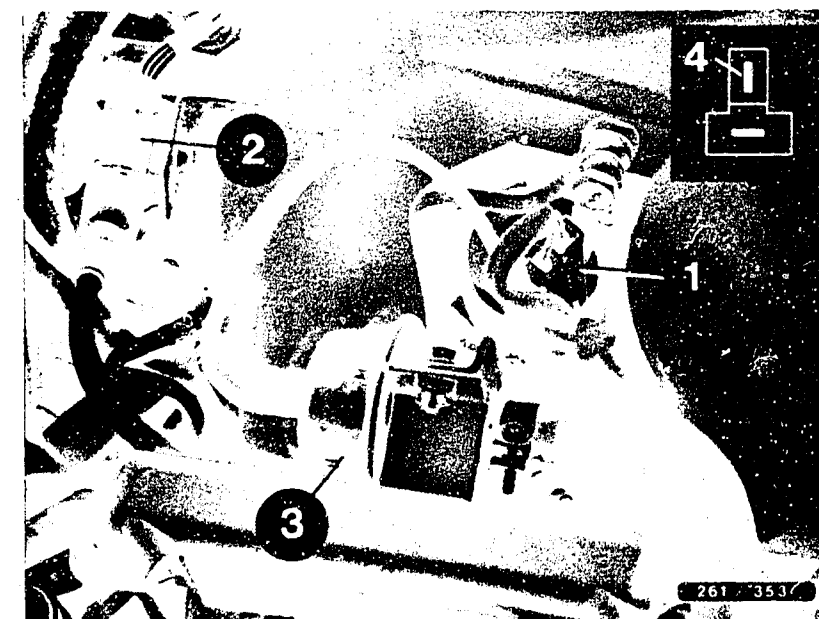
yes

Give quick burst of throttle and observe change of signal:  
(see bottom picture "b").

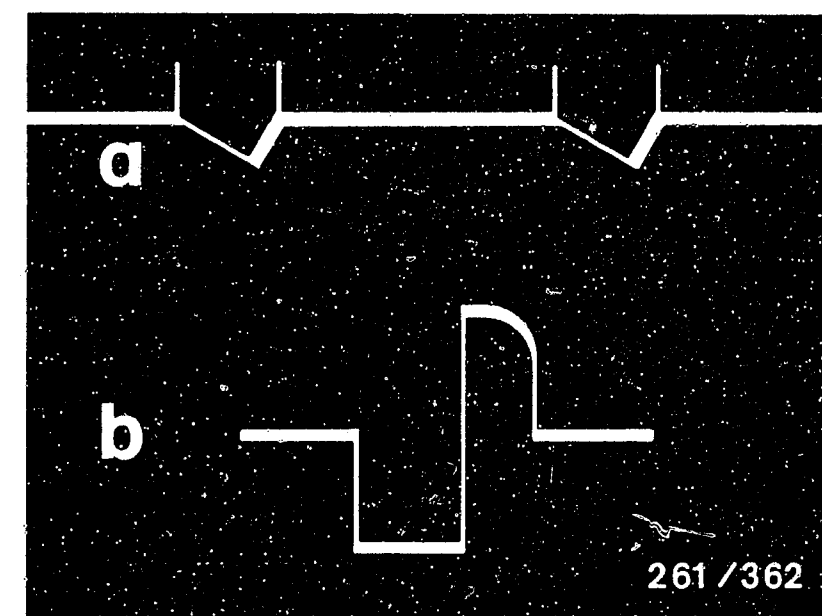
Signal appears only briefly. The width depends on the intensity of the burst of throttle.

Signal present?

no Repeat test several times.  
Replace knock control unit.



- 1 = Timing valve
- 2 = Lambda sensor plug connector
- 3 = Pressure regulator
- 4 = Negative connection on timing valve



C1

Trouble-shooting (timing valve)  
Porsche



C2

Trouble-shooting (timing valve)  
Porsche



## 10.8 Checking the full-load function

Switch off ignition.  
Disconnect plug from knock control unit and remove handle cover from plug.  
Re-connect plug to knock control unit.  
Connect voltmeter with suitable test prods to term. 18 (+) and term. 20 (-).  
Run engine at idle.  
Make voltage reading.

Test specification: 4...6 V

Voltage present?

no

Check lead from knock control unit term. 18 to Motronic control unit term. 3 for open circuit.  
Check plug-in connections for corrosion, good contacting and open circuit. Replace knock control unit.

yes

Give brief burst of throttle as far as full-load stop:

Voltage briefly becomes lower than at idle.  
(Briefly reading e.g. 0.L with digital multi-meter)

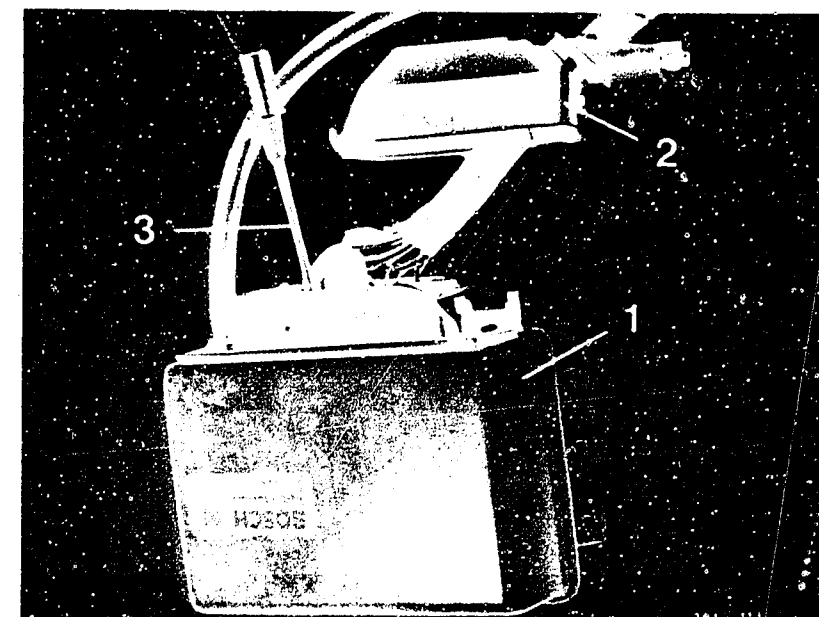
Voltage briefly lower?

no

Repeat test.  
Was burst of throttle sufficient?  
Replace knock control unit.

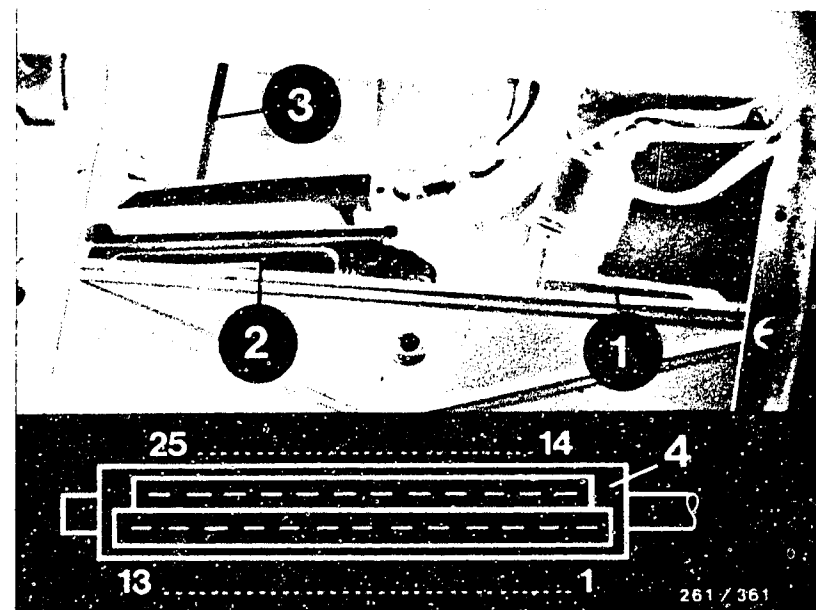
yes

Continued on next picture page



- 1 = Knock control unit
- 2 = Handle cover
- 3 = Test prod

- 1 = Knock control unit
- 2 = Motronic control unit
- 3 = Vacuum hose to knock control unit
- 4 = Top view looking onto plug of knock control unit



**C3**

Trouble-shooting (full-load function)  
Porsche



**C4**

Trouble-shooting (full-load function)  
Porsche





## 10.9 Checking the wastegate

Engine must be cold. Connect pressure pump to control port of wastegate (see picture). Run cold engine at idle and apply approx. 600 mbar gauge pressure to wastegate. Caution: max. allowable pressure 1 bar. After the wastegate has switched, flow noises can be heard in the exhaust pipe. Initially cold exhaust pipe after wastegate warms up in short time; feel exhaust pipe by hand. Other method of testing:

With engine stopped, apply approx. 600 mbar gauge pressure to wastegate and quickly let off pressure again. If clicking noises can be heard, wastegate has switched.

Exhaust pipe after wastegate heated up/clicking noises audible?

no Replace wastegate.

yes

Continued on next picture page



- 1 = Wastegate
- 2 = Exhaust pipe after wastegate
- 3 = Pressure pump



## 10.10 Checking the bypass air valve

1. Bypass air valve not closing  
(Maximum engine power not obtained).

Pinch off air hose between bypass air valve  
and pressure pipe to intercooler.

Measure power on dynamometer.

Still no maximum engine power?

no

Replace bypass air valve.

yes

2. Bypass air valve not opening.  
This can destroy air-flow sensor (air-flow  
sensor flap and potentiometer).

Remove bypass air valve.

Apply approx. 300 mbar vacuum to control port.

Bypass air valve must open.

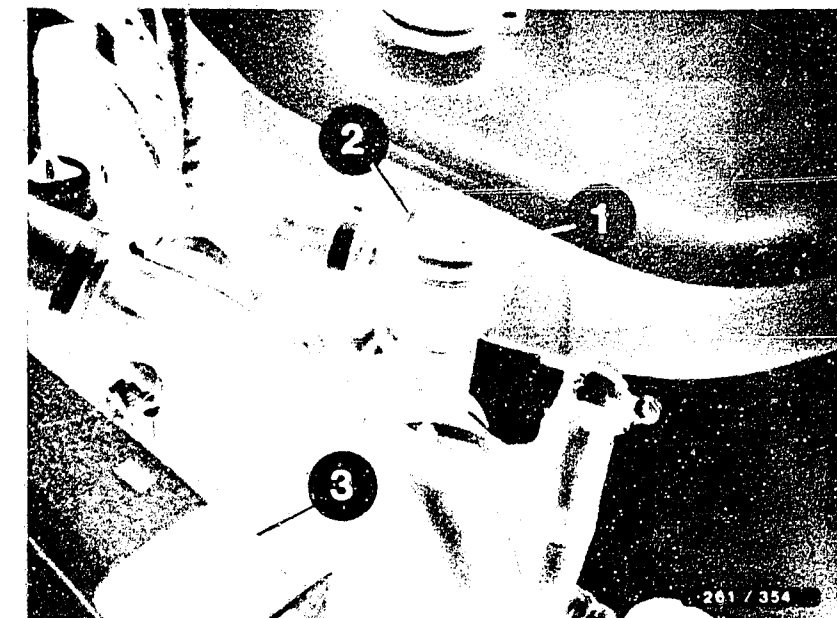
Does bypass air valve open?

no

Replace bypass air valve.

yes

Continued on next picture page



1 = Bypass air valve

2 = Control line

3 = Air-flow sensor



Testing of the knock control is now completed.  
If it was not possible to find the cause of the trouble  
although all components of the knock control have been  
tested, continue trouble-shooting on the Motronic.



# TABLE OF CONTENTS

| <u>Section</u>   | <u>Coordinates</u> |
|--|--------------------|
| Structure of microcard .....   | A 1                |
| 1. Special features .....  | A 2                |
| 2. Test specifications .....   | A 3                |
| 3. Electrical terminal diagram .....   | A 4                |
| 4. Terminal assignment diagram .....   | A 6                |
| 5. Basic diagram .....   | A 7                |
| 6. Installation position of components .....   | A 9                |
| 7. Necessary test equipment and tools .....  | A 15               |
| 8. Important general information .....   | A 17               |
| 9. Trouble-shooting chart .....  | B 1                |
| 10. Detailed trouble-shooting .....  | B 3                |
| 10.1 Self-diagnosis .....  | B 3                |
| 10.2 Visual examination in engine compartment .  | B 9                |
| 10.3 Overall view of engine .....  | B 10               |
| 10.4 Knock sensor .....  | B 11               |
| 10.5 Throttle-valve sensor .....   | B 15               |
| 10.6 Checking the knock control unit: Supply<br>voltage and spark-advance angle signals<br>(TD and TD (1)) ..... | B 19               |
| 10.7 Checking the timing valve .....   | B 23               |
| 10.8 Checking the full-load function .....   | C 3                |
| 10.9 Checking the wastegate .....  | C 5                |
| 10.10 Checking the bypass air valve .....  | C 7                |



© 1988 Robert Bosch GmbH  
Automotive Equipment - After-Sales Service  
Department for Technical Publications KH/VDT,  
Postfach 50, D-7000 Stuttgart 1

Published by: After-Sales Service Department for  
Training and Technology (KH/VSK). Press date: 11.1988  
Please direct questions and comments concerning the  
contents to our authorized representative in your  
country.

This publication is only for the use of the Bosch  
After-Sales Service Organization, and may not be  
passed on to third parties without our consent.

Microfilmed in the Federal Republic of Germany. Micro-  
photographié en République Fédérale d'Allemagne.

